

MOTOR AGE

Vol. XXXIV
No. 1

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CHICAGO, JULY 4, 1918

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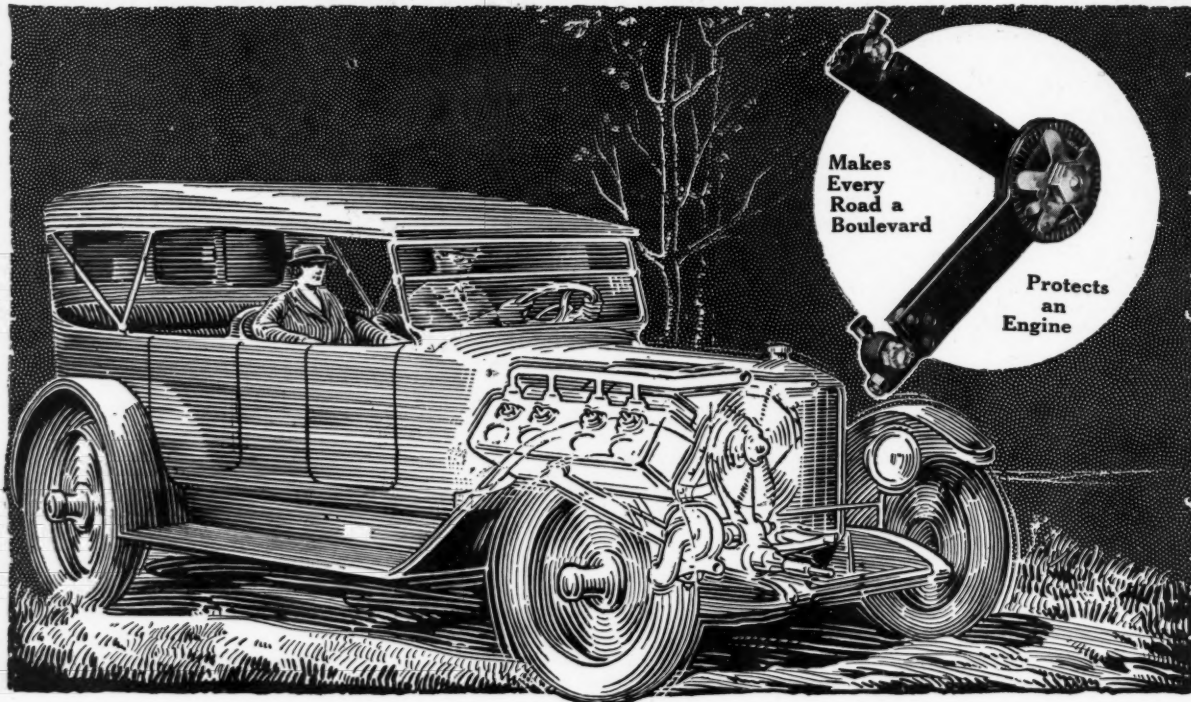
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MOTOR AGE

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NEXT WEEK

Among the features for next week will be the article on determining the proper belt-power farm-operative equipment to fit a certain tractor model and an article on return loads possibilities out of Chicago, in addition to other features.



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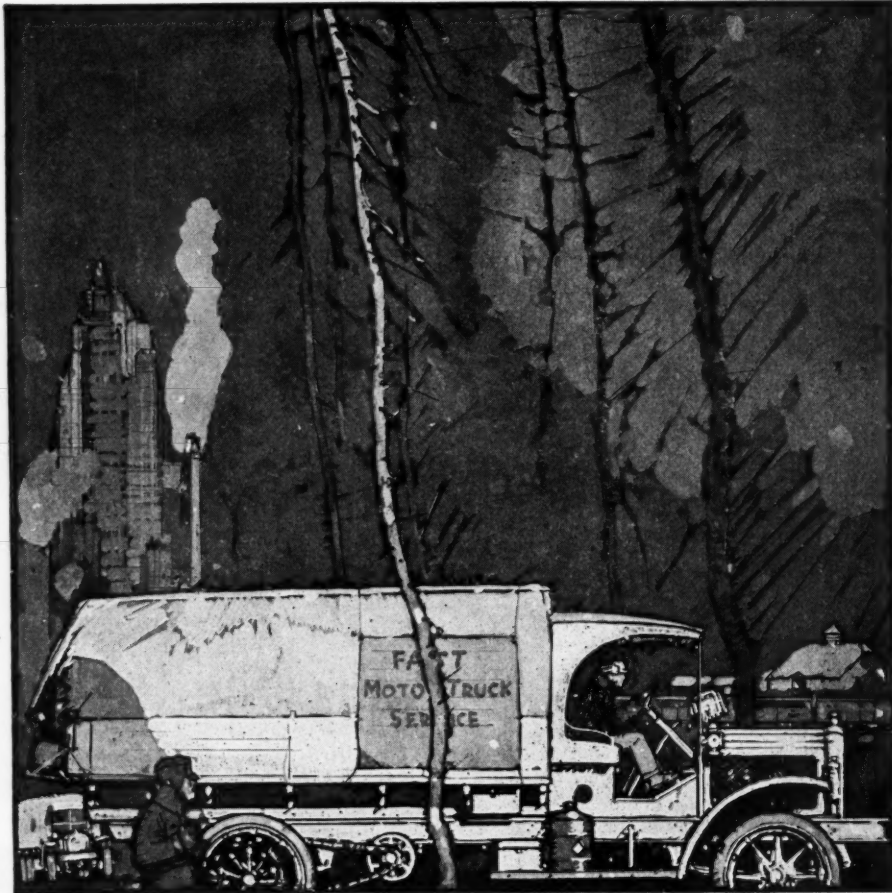
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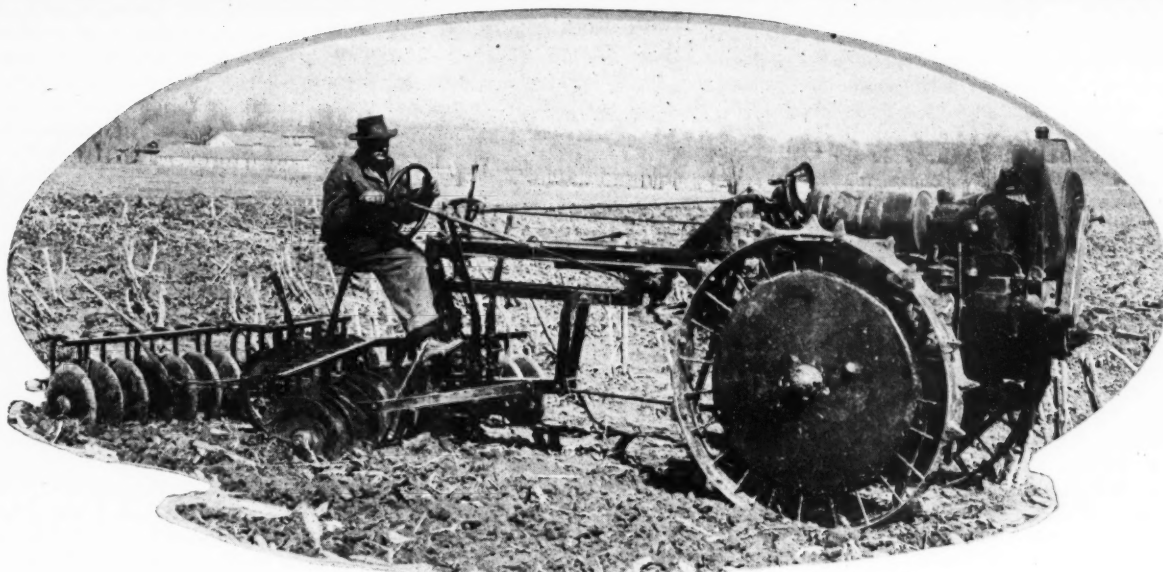


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MOTOR AGE



Crawler type tractor pulling engine plow such as is commonly used with tractors

Fitting the Tractor to the Job

In Two Parts—Part I

THE automotive dealer will demonstrate his fitness for the tractor business by the quality of the service he renders and the degree of satisfaction he produces among his customers. He also must depend upon the same factors for the profit he makes from the tractor business. In a majority of instances, too, they are likely to determine his permanency in the trade. This merely indicates their importance and shows how necessary it must be for the dealer to consider them. While service and satisfaction are coupled together here they really should be considered as cause and effect, the degree of satisfaction depending directly upon the quality of service. This emphasizes the relatively greater importance of the former and makes clear the reason why the dealer should clearly understand where service begins. The old adage, "A good beginning makes a good ending," applies with particular appropriateness to service, for the reason that a mistake at the beginning almost always entails service without end. This is uneconomic and unprofitable.

Service then should begin before the tractor is sold. This broadens the common conception of what constitutes service and implies that the tractor dealer should take some things into consideration that fre-

This Week

How to tell what tractor the farmer needs.

How to tell whether the farmer should have a two-bottom or three-bottom plow.

How to hitch plows and harrows in combinations together.

Drawbar uses of a tractor—to determine the sizes of the equipment.

Next Week

Fitting the tractor to belt work.

How to determine the best sizes of belt-driven machines.

Silo Filling.

Huskers and Shredders.

Power Corn Shellers.

Feed Grinders.

Hay Presses.

Finding pulley diameters.

By Fred M. Loomis

Motor Age Editorial Staff

quently are not given any thought. A moment's consideration will justify this widening of the meaning of the term "service" and will make clear the reason why the dealer must begin to render it before the sale is made.

That the tractor shall fit the job is of the utmost importance to the man who buys. Only where this is the fact can it prove to be a profitable investment for him, can it be operated economically and can it be productive of satisfaction. And satisfaction, from whatever point of view, is the end to be attained. It happens, however, that very few farmers who never have had any personal experience with tractors, when they come face to face with the proposition of buying one, are competent to determine offhand just what type and size of tractor they ought to have. They have certain well defined and definite needs upon their farms which must be met, but how well this, that or the other tractor will meet these needs they ordinarily cannot decide without advice. They are just as likely as not to be attracted by some feature which is not essential to the efficient working of the tractor in the conditions they have to meet, or they are led astray by such an inconsequential matter

as price. The result is that a misfit between tractor and job results. An outstanding fact which appears in every investigation of tractor usefulness which has been undertaken is that in a majority of instances where farmers have reported uneconomic or unsatisfactory results the reason has been that in the first instance the farmer made a misjudgment and bought a tractor unsuited to his requirements, one too small or one too large or unwisely selected for some other reason. Where there is a proper co-ordination between the tractor and the work which it will be called upon to do, the results almost always are satisfactory. This is eliminating the human factor as a disturbing influence, which may be done safely in considering averages.

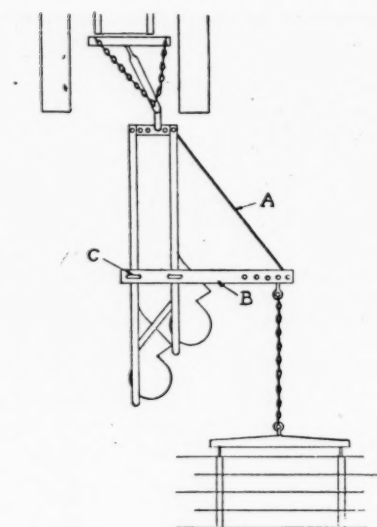
The reason the farmer is unable usually to select wisely when it comes to buying his first tractor is because he is accustomed to estimating his work in terms of horses only. He knows nothing about mechanical horsepower and does not know how to convert animal horsepower into the equivalent terms of mechanical horsepower. It is natural and inevitable that he should look at the tractor, which he buys ostensibly as a substitute for his horses, in terms of the only unit of power he knows, the horse. He is led to this mistake more readily because of the method of rating tractors in terms of drawbar horsepower. The farmer makes the error of considering the horsepower rating of a tractor on the drawbar as the exact and invariable equivalent of the power of just as many horses as the rating calls for. For instance, a tractor rated at 10 hp. on the drawbar means just the same to the inexperienced farmer as the power of ten horses.

Only Approximately Correct

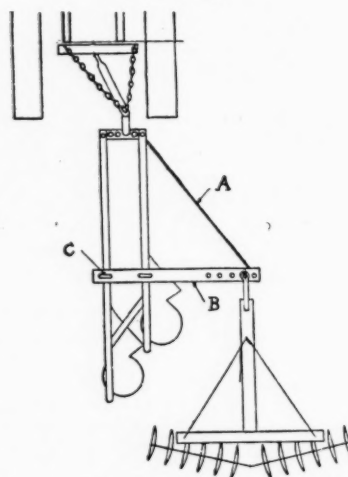
This is the case only under a certain set of ideal conditions, and only approximately correct even then. For instance, a horse normally exerts a pull on the drawbar equal to about a tenth of its weight. Now if all farm horses weighed exactly 1500 lb., walked always while at work at a uniform speed of $2\frac{1}{2}$ m.p.h. and had level ground to walk over, then every horse in 1 min. would exert at the drawbar the equivalent of one mechanical horsepower. Conversely, if all tractors were built to run at a uniform speed of $2\frac{1}{2}$ m.p.h. and had level ground always to run over, then in 1 min. every tractor, too, would exert a pull at the drawbar equivalent to one mechanical horsepower. Only so far as this can the rating of a tractor at the drawbar be compared to the power of as many horses as the rating indicates.

But farm horses vary infinitely in weight. In general they merely approximate $2\frac{1}{2}$ m.p.h. in speed. Tractors, in turn, manifest all speeds from 1 m.p.h. on low gear to 9 m.p.h. on high, although most of them have a much narrower range than this. Nevertheless, every variation from the normal in the speed of a tractor profoundly affects the horsepower developed at the drawbar and destroys the relation the farmer imagines exists between the rating as given and the equivalence in horses.

In addition, there is a fundamental difference between animal power and tractor



Combination of engine gang and peg-tooth harrow for tractors of 10-20 rating and over



Combination of engine gang and disk harrow for tractors of 12-24 rating and over

power, which would throw the equivalence all out of proportion as soon as the condition of absolute equality is disturbed, and it usually is disturbed most of the time. This fundamental difference is that animal power is elastic, while tractor power is absolute. While the average farm horse may be considered to exert one mechanical horsepower in a minute of time at normal plowing speed, he is capable, in an emergency and for short distances and for short periods of time, of exerting several times as much power, bringing his pull temporarily up to 500 to 700 lb. This occurs when hard spots in the soil are encountered in plowing, in bursts of speed or in short uphill pulls. In other words, horses have a reserve of power which may be drawn upon in case of need.

The tractor, upon the contrary, has no reserve of power. A tractor capable of pulling 1500 lb. at the drawbar on level ground and at $2\frac{1}{2}$ m.p.h. immediately loses efficiency if these conditions are changed. For instance: if the speed of the tractor which is rated at 1500 drawbar pull at $2\frac{1}{2}$ m.p.h. be increased to 3 m.p.h. the pull is reduced immediately to 1250 lb.

and falls to 1070 lb. at 3 m.p.h. Grades have a similar, although not as marked, effect. The approximate rule is that the weight of the tractor and its plow which must be moved by the power of the engines requires 1 per cent more power for every rise of 1 ft. in a distance of 100 ft. As an example, a tractor weighing 5000 lb., pulling a plow weighing 650 lb., must exert a pull over that exerted on level ground of 565 lb. when climbing a grade of 10 per cent, or one which rises 10 ft. in 100. Obviously this must operate to reduce the drawbar pull available for overcoming soil resistance by about $3\frac{1}{2}$ hp. or cuts the power of a 10-hp. tractor to $6\frac{1}{2}$ hp. on the grade. As a tractor has no reserve power as a rule over and above its rating which can be drawn upon to meet such an emergency, the efficiency of the tractor must fall. On hilly ground it must run slower to compensate, or it must pull fewer bottoms or at less depth.

It is obvious, therefore, that the farmer who has had no experience with mechanical power easily falls into the erroneous belief that because a tractor at normal plowing speed will exert the same power as will ten horses at the same speed, it will do so under all circumstances. He makes no allowance for the lack of elasticity in tractor power and does not appreciate the advantage which horses have in this respect.

Beginning of Service

For the same reason he is more than likely to underestimate the power a tractor should have to meet the soil conditions on his farm. Estimating his power needs by the number of horses he has been accustomed to using in the past, which is the only standard he has to go by, he very naturally thinks that if six of his horses can pull a two-bottom, 14-in. sulky gang, he can do the same thing with a tractor which rates at 6 hp. at the drawbar under the same conditions. When he finds that he cannot he is much inclined to blame the tractor instead of his own miscalculation.

From such mistakes the dealer must save him. This constitutes the beginning of service and must be rendered before the farmer buys. To do this the dealer must know what limitations the tractor labors under in the delivery of its power and how varying conditions affect the maximum power it will deliver. He must have a general knowledge of how speed, grades, soil resistance and other factors affect tractor efficiency and how much allowance must be made for them. Knowing these things and how to apply them the dealer is in a position to advise the farmer as to the type and size of tractor the latter should have which will be capable of meeting the conditions upon that farmer's land. In selling a tractor to a farmer the dealer should know with a reasonable degree of accuracy the character of the soil the farmer will have to plow, the grades he will be compelled to surmount, the size of his fields and other similar factors. These facts the dealer can ascertain with sufficient accuracy by observation or by inquiry so that he will be able to say with practical precision just about what the farmer actually needs in the way of a tractor.

There are dealers, and they have been

singularly successful in the selling of tractors, who positively refuse to make a sale until after they have secured information on all these matters. Instances, many of them, are on record where the dealer has declined to sell the farmer what the latter thought he wanted because the dealer knew it would not meet the conditions, would not accomplish what the farmer expected and would result in trouble and dissatisfaction. These dealers knew what was the probable maximum of difficulty a tractor would have to encounter on a given farm and insisted upon the farmer buying a machine which would compass it. When the dealer has insisted it has happened almost invariably that in time the farmer has testified to the superior wisdom of the dealer and has acknowledged his obligation for the service rendered.

Absolute precision in co-ordinating the tractor to the work cannot be expected in every case, of course. But the dealer who is posted on the factors involved need not make any very serious mistakes. The safe rule always is to insist upon the farmer buying a tractor whose minimum drawbar power rating will still show a surplus over the probable maximum requirement of the conditions present. To be able to apply this rule the dealer should be familiar with the capabilities of the commonly used sizes of tractors in his territory and upon their proved performance he safely may rely in estimating the probable requirements of prospective customers under conditions which are similar on the average in his territory.

Most farmers when buying a tractor purchase it primarily as a plowing power and estimate their tractor needs on the basis of what they require for plowing. As plowing is the fundamental agricultural operation, and as it usually presents the peak load on the farm, this estimation of tractor efficiency is legitimate. Furthermore, it follows, almost invariably, that when the farmer has a tractor capable of meeting his plowing requirements it will have ample power, both on the drawbar and the belt, to compass every other power requirement on the farm.

Knowledge for Dealer

The dealer, therefore, who knows approximately the plowing conditions which are to be met on the given farm, who knows the approximate size and configuration of the fields, who knows about how many acres the farmer intends to plow, always can advise the farmer intelligently as to the type and size of tractor he should buy. In addition, that dealer is in a position to advise the farmer regarding all other power operative equipment, both for drawbar and belt, which the farmer will need to accomplish his work most advantageously, expeditiously and economically. In short, that dealer can so co-ordinate powerplant and equipment that it will be sure to give the greatest measure of satisfaction.

The dealer who can do this is rendering the farmer the very highest type of service. It is the purpose of this article to put such information into the hands of the tractor dealer that he can, once the type and size of the plowing unit is determined, co-ordinate with it every other type of

power machine that is needed upon a farm.

In pursuance of this plan, the first thing the tractor dealer will be called upon to consider will be the size of the tractor which will be competent to do the plowing upon the farm in question. Some of the factors which he must take into consideration already have been noted. These are practically all that are determinative. After the character of the soil to be plowed is taken into consideration, the degree of the predominating grades and the number of acres to be plowed, it should be comparatively easy for him to decide whether the practicable tractor for this job should be one which will pull two or three bottoms. It is not the purpose of this discussion to consider large farms, but rather confine the subject to the farm of 160 to 240 acres, which will be the range in size which the ordinary tractor dealer will be called upon for the most part to prescribe for.

It is impossible to say, as a general rule, what tractor the dealer should recommend for a farm of a given size, because the character of the crops grown, the attitude of the farmer and many other things must determine, but on a farm of the size mentioned the choice naturally will fall between the two and the three-bottom machine and it will happen not infrequently that other considerations, as belt power requirements, will be the determining factor between the two. As a matter of fact, the fitting of the tractor to the job is something which must be figured out in each individual case, as there is no rule which will apply to all. This much may be concluded, however, that if a proper selection of the plowing power be made, in a vast majority of cases the tractor will have sufficient capacity to handle all the other jobs on the same farm; hence, the impor-

tance of making a correct diagnosis of the plowing conditions and prescribing the correct tractor.

In determining whether the particular farmer should have the two or three-bottom plow, the factor which deserves most attention is that of soil conditions. This is due to the fact that various kinds of soil present varying resistance to the passage of the plow bottom. The resistance offered to the bottom in plowing is measured by taking the cross-section of the furrow slice in square inches and multiplying this by the resistance per inch offered by the predominating character of the soil on the farm. As an example, the plow bottom cutting a furrow of 14 in. in width and 6 in. in depth presents a cross-section of 84 sq. in. According to the character of the soil which is to be plowed, the resistance at a speed of $2\frac{1}{2}$ m.p.h. will vary from 252 lb. to 1680 lb.

A table of soil resistance, based upon experience in plowing in all sections of the country, will make this clear. Such a table follows:

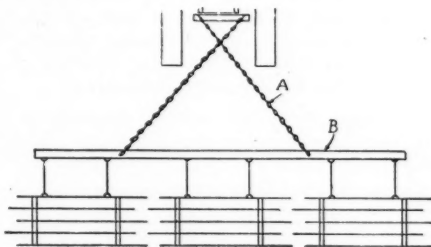
In sandy soil	.....2 to 3 lb. per sq. in.
In corn stubble	.....3 lb. per sq. in.
In wheat stubble	.....4 lb. per sq. in.
In blue grass sod	.....6 lb. per sq. in.
In June grass sod	.....6 lb. per sq. in.
In clover sod	.....7 lb. per sq. in.
In clay soil	.....8 lb. per sq. in.
In prairie sod	.....15 lb. per sq. in.
In virgin sod	.....15 lb. per sq. in.
In gumbo	.....20 lb. per sq. in.

It must be evident that the character of the soil, then, must determine very largely the number of bottoms it is possible to pull with a tractor which otherwise will be competent to do all the work necessary on the given farm. Suppose the farm consists of clay soil, the resistance of which is given at 8 lb. per square inch in the table. This means the resistance is 672 lb. for one 14-in. bottom, or 1244 lb. for an engine gang of two 14-in. bottoms. As the horsepower rating of a tractor is based upon its drawbar pull at a speed of $2\frac{1}{2}$ m.p.h., at which speed a pull of 150 lb. is taken to represent 1 hp., the pull of two 14-in. bottoms through clay soil at normal plowing speed would take a tractor rated 8 hp. at the drawbar at the very least, or what is popularly known as an 8-16 tractor, and even this would leave no surplus for the possibility of more difficult spots or for grades.

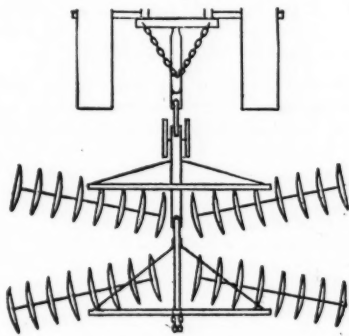
Grades Must Figure

The matter of grades is important also. This already has been considered and the rule given is that the weight of tractor and plow which must be moved by the power of the tractor is 1 per cent for each rise of 1 ft. in 100 ft. of distance, so that if in addition to clay soil there should be grades even of moderate degree, to use the two 14-in. bottoms the tractor would have to rate at least 10-20.

From this it will be evident how the dealer must figure tractor competency in the light of the difficulties it must overcome in accomplishing what the farmer desires it to do. Also it illustrates the fact already emphasized that there can be no hard and fast rule laid down governing the capacity of tractors, for a tractor which easily may be able to pull three bottoms on one side of a fence may find dif-



Pegtooth harrow equipment for tractors of any rating—number of sections determined by drawbar pull of tractor



Tandem engine disk harrow for tractors of 8-16 rating and over—size of harrow determined by drawbar pull of tractor

feulty in pulling two on the other, so suddenly do soil characteristics change. Very rarely is it found to be the case that a field will show a uniform character of soil and a uniform rate of resistance to the plow. This also emphasizes the necessity of selling a tractor with a surplus of power over and above that required for pulling the desired number of bottoms through the soil on the particular farm.

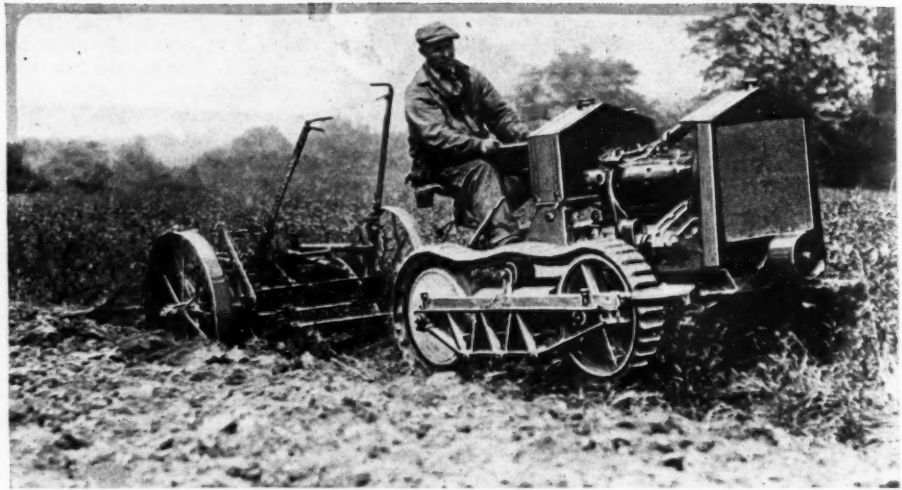
In this connection it is unfortunate that so many tractor manufacturers speak of their particular machines as a one, two, three or four-bottom machine, thus implying that the tractor will pull this number of bottoms under all conditions and in all circumstances. This is by no means the case. What it means in reality is that at normal plowing speed, without considering grades, and at an average soil resistance of about 5 lb. per square inch of furrow soil, the tractor will pull one, two, three or four bottoms respectively. It does not mean that the tractor is able to do this at all times.

Therefore, in making a tentative table which will show the probable capacity of a tractor measured in 14-in. bottoms, it must always be remembered that it is based upon these average conditions and that it is subject to modification where the soil resistance exceeds the average 5 lb. or where the grades are excessive. However, it is possible to make an approximate estimate of the plowing capacity of tractors which the dealer may use as a guide for average conditions. With these precautions in mind, the following is suggested:

Under Normal Conditions

The tractor rated 5-10, under normal conditions, may be considered capable of pulling one 14-in. bottom; the 6-12, one to two bottoms; the 8-16, two bottoms; 9-18, two bottoms; 10-20, two to three bottoms; 12-24; three bottoms; 15-25, three bottoms; 15-30, three bottoms; 20-30, four bottoms; 25-45, six bottoms; and the 40-65, from eight to ten bottoms. These combinations are based upon a conservative estimate and under ordinary conditions the dealer safely may recommend the tractor of the given sizes with the probable assurance that he has a reasonable surplus for emergencies.

Following the plow in the operation of the seed bed is the pulverizing of the



Tandem type of engine disk harrow used behind tractors in preparing seed bed

ground that is accomplished by the use of the peg-tooth harrows, disk harrows, spring-tooth harrows, cultipackers and similar equipment. Peg-tooth harrows are made in sections of approximately sixty teeth each and the draft of one section is normally about 300 lb. Therefore, an 8-16 tractor which has a normal drawbar pull of 1200 lb. would handle easily four sections of peg-tooth harrow. The number of sections for tractors of higher rating easily can be estimated from the foregoing. With tractors of higher rating it is not uncommon to attach peg-tooth harrows on behind the plows. This performs both operations at one and the same time. Knowing the draft of the plows and the draft of the harrows, it is comparatively easy to figure that combination which will be within the power capacity of the tractor. Disk harrows are made in 5, 6, 7, 8, 9 and 12-ft. lengths, which in the engine type of tandem harrow corresponds to twenty, twenty-four, twenty-eight, thirty-two, thirty-six, forty and forty-eight disks respectively.

The draft of a disk harrow depends in part upon its weight, which varies with the make to some extent and upon the depth to which it is permitted to cut, it being the custom in most instances to weight the harrow. As a rule it may be said that the 6 or 7 ft. tandem-disk har-

row of the horse-drawn variety is considered to be good hard work for six horses. The engine disks are somewhat heavier, consequently are a little harder to pull. Likewise there is sometimes difficulty in getting traction with the lugs furnished for plowing with some of the tractors. However, such considerations need not be taken into account here. A tentative co-ordination of tractors and disk harrows may be suggested with the same observations and qualifications as in the case of plows, as follows: A 6-12, 5 ft.; 8-16 and 9-18, 5 ft.; 10-20, 7 ft.; 10-24 and 15-25, 8 ft.; 15-30 and 20-30, 9 ft.; 25-45, 10 ft., and a 40-65, 12 ft. As in the case of peg-tooth harrows, where the tractor has sufficient power, sometimes two or three disk harrows are hitched to the tractor in combination. However, under ordinary circumstances the farmer will own but one tandem disk.

Uses of Tractor

There are suggested in the sketches the manner of hitching plows and harrows in combinations together.

As the draft of a spring-tooth harrow is about the same as a pegtooth or a trifle more, it need not be considered further. Also any tractor will pull any cultipacker the farmer may have.

Following the preparation of the seed

Suggested Sizes of Power Farm-Operative Equipment for Tractors of Given Rating

The suggestions contained in this table are suggestive only. They are not to be considered as established recommendations. The purpose of the table is rather to illustrate method of determining power equipment which shall be in accord with the power of the tractor than to indicate what shall be recommended in any given case

Tractor Rating	Engine Gang Plow—No. Bottoms	Engine Tandem Disk Harrow—Length in Feet & No. Disks	Threshing Machines—Cylinder—Measurement	Silo Filler Width of Throat	Husk & Shredders—No. Rolls	Corn Shellers, Spring—No. Holes	Corn Shellers, Cylindrical—Bu. Per Hr.	Power Feed Grinders—Bu. Per Hr.	Power Hay Presses Size Baling Chamber	Tons Per Hr.
5-10	1	.....	Small	8	2	2	.....	8-20	14x18	2-3
6-12	1 to 2	5 ft.—20	{ Small 18x36	10	2-4	2	.....	8-20	14x18	2-3
8-16	2	6 ft.—24	22x40	12	4-6	4-6	.....	20-30	16x18	3
9-18	2	6 ft.—24	24x42	14	4-6	4-6	.....	20-30	16x18	3 1/2
10-20	2 to 3	7 ft.—28	28x48	14-16	4-6	4-6	250-400	30-50	{ 17x22 18x22	{ 3 1/2 4 1/2
12-24	3	8 ft.—32	32x54	16-18	6-8	6	250-400	30-50	22x36	9-10
15-25	3	8 ft.—32	36x40	18-22	6-8	.....	500-800	30-50	22x36	9-10
15-30	3	9 ft.—36	40x66	18-22	8	.....	500-800	30-50	Largest	.....
20-30	4	9 ft.—36	40x66	22	10	.....	Largest	50-up	Largest	.....
25-45	6	10 ft.—40	Largest	22	10	.....	Largest	50-up	Largest	.....
40-65	8 to 10	12 ft.—48	Largest	26-up	10	.....	Largest	50-up	Largest	.....

bed, it is customary in some sections of the country to use a tractor for seeding. Occasionally a farmer uses a tractor for listing corn. The draft of a 14-in. lister will be about 50 per cent greater than that of a corresponding 14-in. bottom, so that the dealer will experience no difficulty in figuring the co-ordination. Small grain is planted with seeders or drills. The seeder is a machine of light draft and any tractor from the 6-12 upward will take care of any combination of seeding machines the farmer is likely to have. The draft of grain drills is considerably greater. For instance, the 7-ft. grain drill has a draft of from 400 to 600 lb., depending upon whether it is in type single-disk, double-disk, hoe or shoe. An 8-ft. disk drill has a draft of from 600 to 800 lb., depending upon the same classification. Therefore, with the small tractors up to 8 hp. on the drawbar it would probably not be well to recommend the use of more than one drill, but with tractors rated higher it is customary for farmers who possess the equipment to work the drills in batteries. However, these need no special instructions other than those already given.

This practically covers the ordinary drawbar uses of a tractor on the average farm. Here and there, it is true, a tractor is used for harvesting, but for the most part this is in the region of large farms where more than one binder is hitched behind the tractor. Pulling a binder on the smaller farms of the country is not common tractor practice but will increase with time. The same may be said about the use of the tractor in the hay field. None of the operations connected with haying, from mowing to loading, is too heavy for an ordinary team, and, except from the viewpoint of speed perhaps, there is no great economy in the use of a tractor of ordinary size in making hay. There is considerable more excuse for using the tractor on the corn harvester. But, whether tractors are used for these jobs or not, it may be accepted as a general fact that whenever the farmer owns a tractor large enough to do his plowing he will have power enough to carry on any of the harvesting operations mentioned.

RETURN LOADS FOR ST. LOUIS

St. Louis, July 1—The first effort at taking up the return load movement in this city was made last week by the traffic bureau of the chamber of commerce. Members of express firms and a committee of the St. Louis Automobile Manufacturers' & Dealers' Association were invited to participate. Traffic men of several large mercantile establishments having heavy near-by shipments were present.

Traffic Manager Coyle of the chamber, after hearing a statement of the traffic conditions to nearby cities, asked the managers of the express and delivery lines to submit to him their schedules. The first movement will be to co-ordinate and make stable these schedules.

Meetings in the interest of better truck service will be held twice monthly. C. E. Lightfoot of the General Motors truck branch and Harry Newman of Harry Newman, Inc., represented the truck dealers and were the promoters of the conference.

War Board to Standardize Tire Sizes

Five Classes Selected to Conserve Rubber and Other Types Will Be Discontinued

WASHINGTON, June 29—The program for the standardization of pneumatic tires for passenger cars and trucks has been completed by the War Industries Board with the aid of the War Service Committee of the rubber industry. The plan, which has the approval of the National Automobile Chamber of Commerce, the Tire and Rim Association and the Tire and Rim Division of the Standards Committee of the Society of Automotive Engineers, is for the conservation of rubber. The sizes of tires are placed in five classes. The first includes those sizes which will be continued and which can be adapted to almost all makes of motor cars. The second class includes types and sizes for cars in some instances no longer manufactured but which will require the sizes for the next few years. The third class comprises unusual sizes for which there is little or no demand and for which there are substitutes and these will be discontinued within the next eighteen months.

continued within the next eighteen months.

The fourth class includes sizes and types for which oversize can be used and which are in some instances already without demand. These will be discontinued in manufacture within the next four months. The fifth class includes all other sizes and types not mentioned.

Following is the complete program as outlined by the War Industries Board to the manufacturers of motor car tires and motor cars:

CLASS A

30 by 3½ clincher, plain and non-skid
32 by 3½ straight side, plain and non-skid
31 by 4 clincher, plain and non-skid
33 by 4 straight side, plain and non-skid
34 by 4½ straight side, plain and non-skid
35 by 5 straight side, plain and non-skid
36 by 6 straight side, plain and non-skid
38 by 7 straight side, plain and non-skid
40 by 8 straight side, plain and non-skid

The manufacture of the types and sizes of tires in class A is to be continued.

CLASS B

30 by 3 clincher, plain and non-skid
32 by 4 straight side, plain and non-skid
34 by 4 straight side, plain and non-skid
32 by 4½ straight side, plain and non-skid
33 by 4½ straight side, plain and non-skid
35 by 4½ straight side, plain and non-skid
33 by 5 straight side, plain and non-skid
35 by 5 quick detachable and non-skid
37 by 5 straight side and non-skid

The manufacture of the types and sizes of tires included in class B is to be discontinued not later than Nov. 1, 1920.

CLASS C

33 by 4½ straight side, plain tread
36 by 4½ straight side, non-skid tread
35 by 4½ quick detachable, non-skid tread
37 by 5 quick detachable, non-skid tread

The manufacturer of the types and sizes of tires included in class C is to be discontinued not later than Nov. 1, 1919.

CLASS D

30 by 3½ straight sides, non-skid
32 by 3½ quick detachable, non-skid, clincher non-skid
33 by 4 quick detachable, non-skid, clincher non-skid
35 by 4 straight side, non-skid
29 by 4½ straight side, non-skid
32 by 4½ quick detachable, non-skid
33 by 4½ quick detachable, non-skid
36 by 4½ quick detachable, non-skid, straight side plain
34 by 4½ quick detachable, non skid
37 by 4½ straight side, non-skid
33 by 5 straight side plain

The manufacture of the types and sizes of tires included in class D is to be discontinued not later than Nov. 1, 1918.

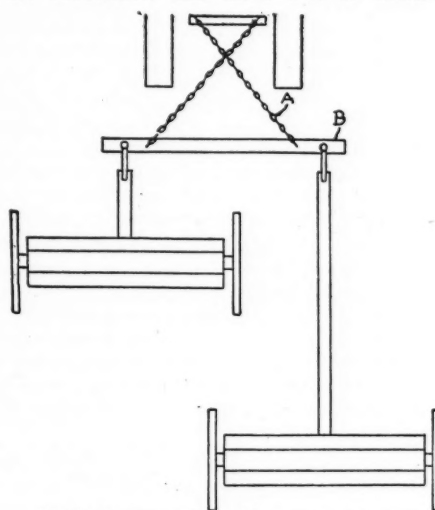
CLASS E

All other types and sizes

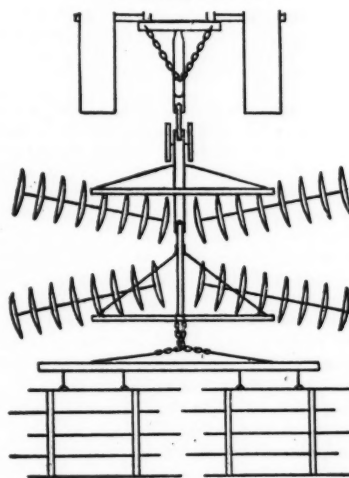
The manufacture of the types and sizes of tires included in class E is to be discontinued at once.

Y. M. CALLS FOR MOTOR CAR MEN

Chicago, July 1—The Y. M. C. A. needs at once 500 motor car men between the ages of thirty-two and fifty for overseas service. Branch managers, sales managers, service station managers, dealers, high-grade salesmen and assistants, expert motor car mechanics and service repairmen, oxy-acetylene welders, radiator repair men and ignition experts are needed. Information can be obtained directly from the War Personnel Board of the Y. M. C. A., 347 Madison avenue, New York, or through the nearest Y. M. C. A. secretary.



Method of using grain seeders behind tractors—same arrangement used also for grain drills



Combination of tandem disk and peg-tooth harrows used behind tractors of sufficient drawbar pull

Dealers Present Case to Congress

Equitable Taxation Is Theme of Brief Presented to the Ways and Means Committee by Vesper

WASHINGTON, June 28—Motor car dealers object to a classification of motor cars as non-utility vehicles but do not object to a slight increase in the present 3 per cent gross sales tax, if the exigencies of the war demand it and approve a tax on car owners.

The preceding are the chief points brought in a brief presented to the Ways and Means Committee by F. W. A. Vesper, president of the National Automobile Dealers' Association here this week. The brief did much to place concretely the dealer viewpoint before the committee, which displayed considerable interest and much attention to the suggestions from an organization that represents thousands of dealers.

Mr. Vesper suggested a Federal license in the form of a wheel tax amounting to \$5 for cars worth up to \$600, \$10 for cars up to \$1,100, \$15 on cars valued to \$2,000, \$20 on values to \$3,000 and \$25 on cars worth more than \$3,000. The dealers were represented in their true light, as a patriotic body of men anxious and willing to do anything the Government needs and desires, but it was pointed out that they must be allowed to stay in business profitably if they are to continue to provide mechanics for the Army, funds for Liberty bonds and other war activities. More than 15,000 dealers deal mainly with rural trade and have helped develop the farm through motor car sales to farmers. The peculiar construction of the motor car dealer establishment caused by the various laws was explained in detail to show that these buildings could not be used for other businesses and that any tax severely curtailing the motor car business would create a great financial loss and a vast number of business difficulties.

Congressmen say four possible plans of taxing motor cars are under consideration: A tax on oil and gasoline used in motor cars solely for pleasure purposes, a tax on chauffeurs, a tax on the gross sales and a tax on car owners. Mr. Vesper was asked what he thought of the tax on gasoline and oil and he proclaimed it impracticable, stating that it would be impossible definitely to keep track of the amounts used solely for pleasure. The Congressmen agreed with him. One Congressman suggested that it might be necessary to use all four methods.

Objection was made to the tax on owners because this would allow a tax on all personal property by the Government. Mr. Vesper suggested an annual licensing plan rather than a direct tax, to be collected at the same time the states collected their wheel tax. This was approved.

Used Cars

Taxation of used cars was considered, and a Congressman declared they would be appraised at too low a value. Mr. Vesper told of the well regulated scale of prices for used cars which could be used to estimate their value for taxation.

The Congressmen generally were well impressed with Mr. Vesper's statements and seemed particularly interested in his plan for a tax. In addition Mr. Vesper pointed out the utility of the passenger car, describing at length the various important utilitarian uses, including statements showing that doctors, contractors, farmers and many industries are aided by the passenger car. He showed how the farmers are keeping their sons on the farms through the use of cars.

The statement before the Ways and Means Committee is given herewith.

but one for actual service purposes. It is a fact usually demonstrated in rural districts that the automobile is responsible for the increased efficiency of the farmer and the increase in the production due to the fact that it has been a time saver for him. Before the advent of the automobile a trip to town meant a loss of practically the entire day, whereas by the use of the automobile it has been shown that the greatest number of trips made to town are usually after working hours, in the evening or at odd times.

Not only this, but the farmer's ownership of an automobile has increased the trading radius of practically every town and village in the country and has been the factor in increasing the business of the merchants of these towns because of the fact that the farmer visits his market oftener. Before the automobile was generally used one living 10 or more miles from his market required practically the entire day to make the round trip with his team. During market times with an automobile a farmer can make his market trips every day without the loss of time.

This one fact alone would disprove the seemingly accepted idea that an automobile is a non-essential and as much is unnecessary in the plan of things at this time.

The unnecessary use of an automobile and the one used strictly for recreation purposes can be determined by proper investigation, and necessary regulation can be made to correct and reduce this use to a minimum. The automobile dealers throughout the United States will be more than willing to co-operate in this.

Dealers in Smaller Cities

The automobile business has become an industry so large in its proportions that it has built up around itself an organization of distribution probably second to no other industry in the country. Its sale and handling is similar to no other industry and it has had to develop a peculiar organization of its own which in this country is made up of over 28,000 establishments devoted to the sale and number possibly 2500 or 3000 located in what is known as automobile distributing centers, the dealers in which either sell cars to the residents of large cities or in addition thereto have jurisdiction over the distribution of the cars in a large territory tributary.

In addition to this there are approximately 25,000 dealers located in the smaller cities, whose business is almost entirely made up of the sale of cars in their surrounding neighborhood, the largest proportion of which goes into the rural and urban districts adjacent to them.

These dealers have, owing to the peculiar requirements of the business, built or had built for them buildings to meet their requirements, and as a result would, if unable to continue the sale of automobiles, be placed in a position where they would be unable to utilize these properties without very expensive rearrangement.

A majority of these dealers, possibly 85 per cent, do not own the buildings but occupy them under lease, and in the building of them—a greater proportion being built to the dealers' specifications—loans have been contracted, the payment of which depends upon the returns received. A serious disturbance of the business would endanger the safety of the investment.

Besides this nearly, if not all, of these buildings are built under special restrictions prescribed by law on account of the peculiar hazard of the business, which, by its own observance,

The Case for the N.A.D.A.

By F. W. A. Vesper

President National Automobile Dealers' Association

IN appearing before you as representative of the automobile dealers of the United States, our desire is first to make plain the fact that we do not oppose any equitable tax on the automobile business where it is considered necessary to raise revenue or where it is for the purpose of having the industry bear its proper proportion of the expense of conducting the war. It is rather our desire to place before you what seems to us as an injustice, due to the mistaken classification under which the automobile has apparently been placed, because its proper place in our national affairs has not been fully understood.

That the automobile has been one of the world's largest factors of development is apparent by the multitude of uses to which the car is being put, all of which, when taken into account, clearly demonstrates the designation "pleasure car" a misnomer.

Of all the cars built and sold, less than 20 per cent can properly be called purely recreation vehicles and while in this classification might

appear such types of cars as speedsters, broughams, town cars, etc., yet even these are used in a great measure not for recreation purposes only, but as in the instance of the closed car or town car, usually as the family vehicle. Therefore they come in for a share of utilitarian service.

It is safe to say that the larger proportion of the balance of passenger cars are combination cars which are being used in actual business pursuits part of the time and the balance of the time possibly the same as the spring-wagon and the surrey of olden days for recreation purposes on Sundays and evenings.

A careful canvass of almost any locality will show that comparatively few automobiles of the latter type are being used exclusively for recreation purposes and that in the combination the actual service usage predominates. Nearly half of the moderate priced cars are sold in what is known as the rural districts, and a large proportion direct to the farmer himself, who utilizes the car not as a recreation vehicle

renders them unfit for any other line of business.

It is a significant fact that there is no line of merchandise that will replace automobiles in the hands of a dealer. There is nothing now manufactured that can be taken into an automobile dealers' organization to be handled and sold by the same equipment, consequently it would mean practically the entire disorganization of the establishments of a large number of the 25,000 of what might be termed "small town dealers."

There is no other business, we believe, where special equipment for the handling of sales and distribution is so necessary, nor is there any other business where some satisfactory addition or substitute cannot be taken on when the prime business itself is not curtailed, nor is there any other business where its special sales organization cannot quickly be utilized in the handling of other merchandise.

Conservatively figuring, eight people dependent on a dealer's establishment gives approximately 200,000 people who are directly affected. Add to this, a conservative estimate of 20 in the large city distributing organizations would make 50,000 more. This applies purely to the dealer or sales organizations and does not take into consideration something like 25,000 additional strictly garage owners, who are not actually sellers or handlers of automobiles but are established for the purpose of maintenance, care, etc., nor does it take into consideration the strictly accessory dealer who is neither a garage man nor a seller of automobiles but who maintains an establishment for the purpose of selling and distributing automobile supplies of various sorts.

Therefore, an actual hardship would develop to the exclusive automobile dealer whose place of business has been built for the purpose and whose entire investment is represented in a building and organization constructed for the purpose of handling automobiles and which is, in most cases, not practical for any other line of business without a large expenditure for rearrangement.

Conserves Man Power

A substantial decrease in the efficiency and production of our farms is sure to result if the farmer cannot supply himself with an automobile if he requires it, not only because of the use the automobile has been in itself from an actual service standpoint but because it has been one of the greatest factors for keeping the boy on the farm that has ever developed. Careful investigation of any rural district will readily demonstrate the fact that where an automobile is owned by a farmer, his children are remaining with him longer, due to the fact that by its use they are enabled to enjoy some of the conveniences, the lack of which have in the past driven them to the cities.

While this use of the car by the young people of the family of the farmer for trips to town and otherwise might easily be construed as a recreation feature, the fact yet remains that it has resulted in actual conservation of man power on the farm. Besides this there is no question but what the efficiency of the farmer has been increased because in his use of the car a certain recreation has been given him which cannot help but have been beneficial to him mentally and physically.

Nearly 2,000,000 of the automobiles now in use are owned by farmers. A careful investigation in any rural district will indicate that the largest proportion of these cars are a necessary part of a farmer's equipment, and in sparsely populated sections it is as much or even more necessary to a farmer.

As an evidence of this fact, the registration records show that the strictly agricultural states have the largest per capita ownership of automobiles; Iowa and Nebraska have one car to every eight people; South Dakota, one car for every ten people; Montana, on account of its distances, one car to every eleven people; Kansas, North Dakota, Minnesota and Cali-

fornia, one car for every twelve people; Arizona, also on account of its distances, one car to thirteen people; Michigan, one car to every fourteen people; Indiana, Wisconsin, Colorado, Ohio and Wyoming, one car to every fifteen people. This evidence of car ownership increases gradually through the balance of the principal farming states at about the same ratio.

It will be noted in the states mentioned above that there are practically no large cities, with the possible exception of California, Ohio and Michigan. These figures, which are as of June 30, 1917, are clear evidence of the fact that the motor car is used more extensively for rural utilitarian purposes than for so-called recreation purposes in large cities.

When the figures are available as of June 30, 1918, the proportion may change slightly, but if so, it is safe to assume that the change will be an increase in the farming states rather than the others. For your further information a complete list of cars registered, dealers by states, etc., I attach hereto a statement prepared by *Automotive Industries* giving the figures in detail.

From the service point of view in cities naturally comes the car used for business purposes during business hours, under which classification come cars used for light delivery, by physicians, salesmen, solicitors and dozens of others. Therefore from an actual transportation standpoint it represents a tremendous usage from those citizens who live in suburban districts now so located that in many cases their only means of transportation is the automobile.

The effect that the motor car has had on the expansion of cities is at once apparent to everyone because, without the motor car, many of these extensions would not have been possible. The increase of values of suburban properties is therefore almost due entirely to motor car transportation. This also is responsible for the increase of farm values due to the fact that distance from the market or city is not now the factor that it was before the motor car was so universally used.

Take the evidence for instance of any practicing physician, especially the general practitioner in the moderate sized cities or country. In his work alone the use of motor cars has increased his efficiency many times over, because of his ability to increase his zone of usefulness and in rural districts particularly the doctor has been able to render quicker aid to hundreds of more cases than he was able to do in the days when he was obliged to serve them in the old way with a team.

While I do not have the exact figures, yet I have been informed that there are nearly 150,000 doctors in the United States and it is safe to assume that 95 per cent of them are owners and users of motor cars in actual service. This is only one of many of the strictly utilitarian uses to which an automobile is put, but it illustrates in no small way the feature of the automobile industry, which is not generally taken into account.

As stated in the beginning, the automobile

dealer does not object to the levy of an equitable tax for the purpose of raising revenue for the conduct of the war but believes that any tax so levied that will stop or greatly curtail the manufacture and sale of automobiles will not only be unwise but unwarranted from a standpoint of the nation's efficiency, and that any tax levy that will tend to handicap the prospective purchaser in buying an automobile or one that will undermine the establishment of the dealer is not justified.

We believe that no patriotic dealer will object to paying any tax that is not out of proportion with other lines of business, nor that any owner of an automobile will object to paying a federal tax upon his car if it is levied as a war measure.

Merely as a basis for calculation in order to arrive at a possible revenue from a federal or wheel tax standpoint, the following schedule is presented as one which the dealers believe will be an equitable one and will meet with no serious objection from any patriotic owner of a car. Take for instance a tax of \$5 on a car selling for \$600 or less; \$10 on a car selling for up to \$1,100; \$15 on a car selling for up to \$2,000; \$20 on a car selling for up to \$3,000; and \$25 for a car selling for over \$3,000.

This would net an average of approximately \$13 per automobile per year, if figured on the average of the first four classes, as those greatly predominate in numbers. Multiply this by approximately 5,000,000, which is the figure given as the number of automobiles now in use in the United States, and it will net \$65,000,000. Add to this the cars to be produced during the coming season and the amount will of course increase in that proportion.

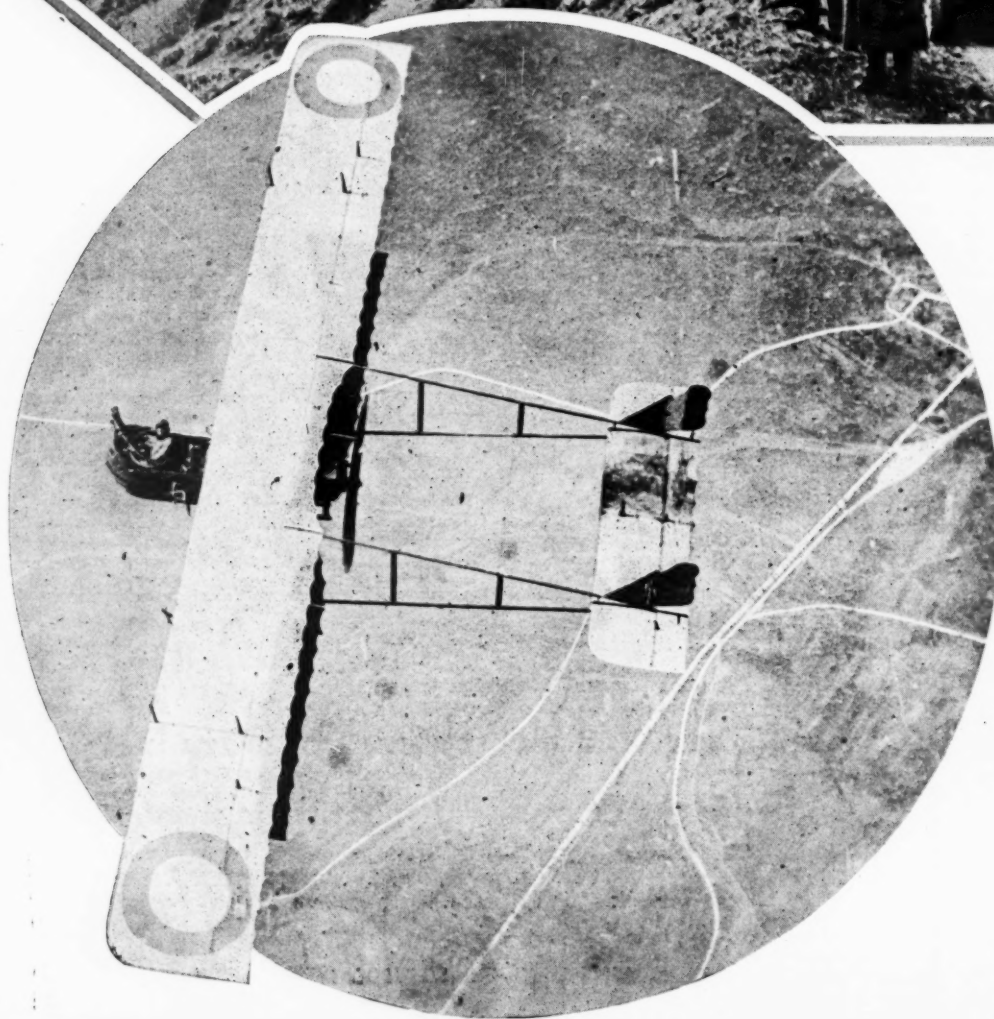
This tax can easily be collected, as automobiles are registered by states and by cities and in many cases counties, and this amount of tax can easily be collected at the time the state licenses are made returnable and will therefore not seem to present any very great expense or any great difficulty of manipulation. *A tax of this sort will not represent a hardship either upon the present owner of a car or a prospective purchaser.*

Labor Scarcity Affects Dealers

Causes already in force have had a tremendous effect upon the automobile dealer's business, and one of the greatest has been the scarcity of labor, especially the expert necessary in the repairing and maintenance of motor cars. Yet in spite of this fact the National Automobile Dealers' Association has been vigorously carrying on a campaign for some months which has been highly successful and has been extending as rapidly as possible curtailment in operation in every department where skilled labor is used, for the purpose of making available for the war purposes mechanical help of all classes. It is estimated that through its efforts at least one man per organization has been released to date, which means that by its own efforts upwards of 25,000 skilled drivers

(Concluded on page 15)

The steam and electric railways are inadequate for our transportation needs.
The Motor Car fills the gap.

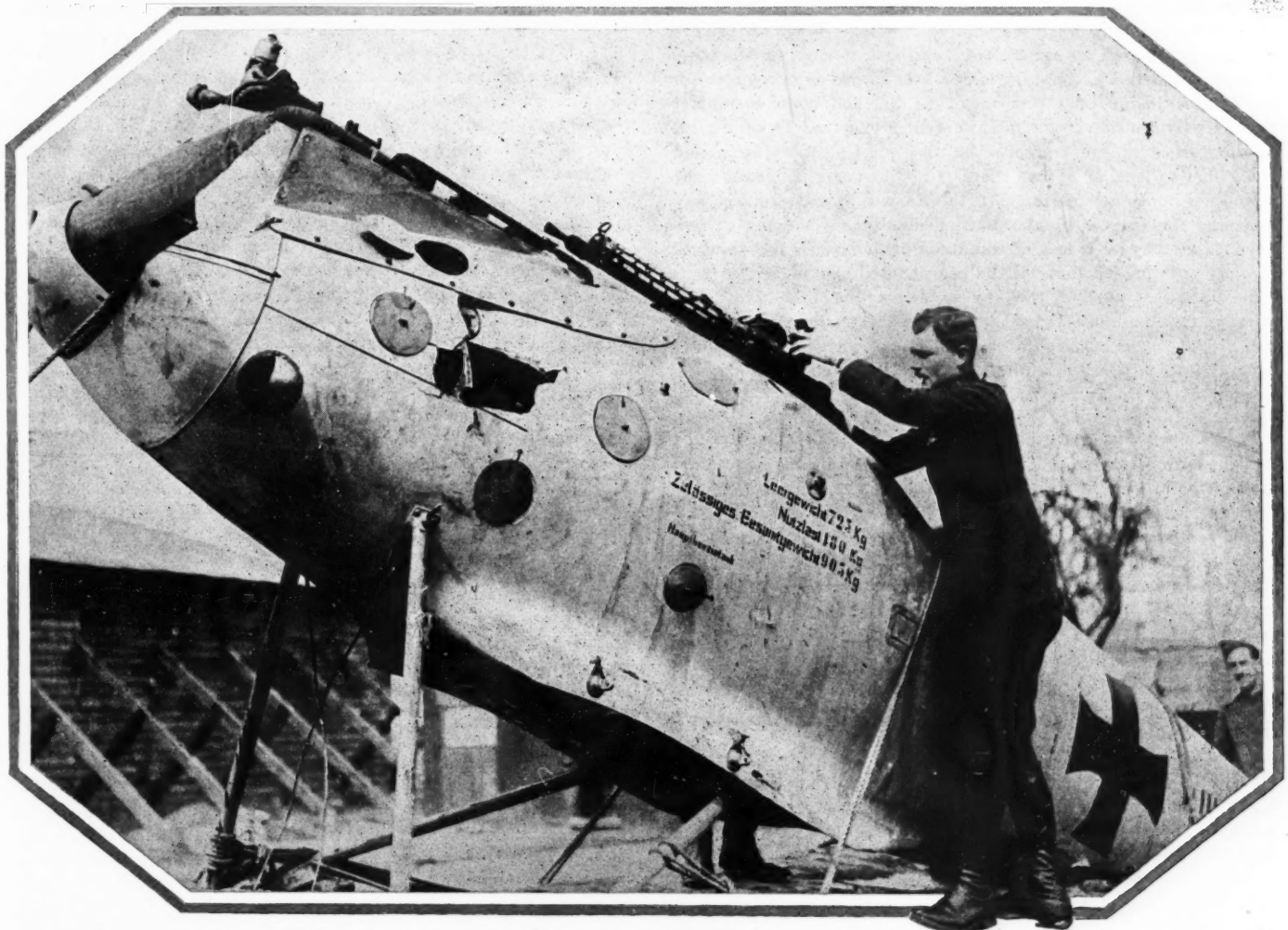


Martial Motors

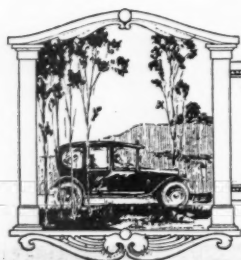
Beyond the Alps lies Italy—an Italy that has met the enemy and routed them. The photograph above shows some of the Italian soldiers on march to the front, with the tall peaks of the Alps in the background. French supply trucks have been helping the Italians, and at the left is shown a French air scout. The plane is flying towards the German lines and was photographed from another French plane flying a little higher. The lines below are of roads and trenches. The approximate altitude at which the plane flies is 1100 feet



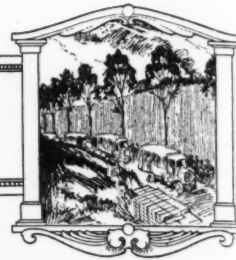
The United States Army Tank Corps is busy enrolling men for this important branch of the military service. Here are the officers and men in charge of the recruiting, with one of their tanks. At the right American fighters in France, on leave, are visiting a small town high up in the hills



On this German plane, brought down by British airmen, can be seen labels for every outlet and part. On the side is its weight in kilograms. Even the propeller is labeled



EDITORIAL



Farm Tractor Service

THE remarks of President C. F. Kettering in closing the engineers' session in Dayton last week contained many suggestions that should be maturely considered in these developing days of this great farm essential. He described the tractor as being in the ox-cart stage so far as its development and application are concerned and that great changes must be made and great improvements introduced before it will measure up to the requirements that war conditions will exact of it.

THAT the tractor is being over-sold and over-represented in many parts of the country is apparent. This happened with the motor truck years ago when any one truck model was sold as a vehicle capable of performing practically any transportation job. To-day too many tractors are sold as machines suitable for every phase of farm work. The process of differentiation in tractor uses has not set in as fully as it should and until it has arrived and is applied there will be over-representation of the tractor followed by consequent evils.

TRACTOR service is the most serious problem that those handling tractors have to contend with. When President Kettering referred to one farmer who lost money on his large farm because it was impossible for him to get repair gears for his tractor inside of three weeks he touched upon a subject that is very sensitive to the farmer and one that is very vital to the future of the tractor. On the question of service and delay due to lack of spares there is no comparison between the motor car and the tractor. If the farmer is cutting his hay crop and the tractor breaks down necessitating a delay of two days, there may be a loss of hundreds of dollars in the value of the hay crop, which loss will be accentuated should heavy rains come and the value of the hay practically be destroyed. The same is true should a breakage occur when harvesting a wheat crop. The cost of delays to the farmer is also true in practically every phase of his work relating to cultivation of the ground as well as to the harvesting of the crop.

IT has been rumored that in some cases delays on tractor spares have been so extreme that the Government has taken the matter in hand. This is most unfortunate. In motor truck days, some years ago, there were cases where trucks were out of commission two months, and in some cases three months, due to failure of correct repair parts to reach the truck owner. Needless to say that particular truck company in question went out of existence some years ago. No company doing business on such a basis could possibly continue in business. With the tractor the necessity for speedy repairs and speedy replacements is greater than with the truck, and the responsibility of the tractor maker to supply the necessary service is correspondingly greater.

SERVICE is the big end of the farm tractor and many have no definite ideas at the present moment as to how it is going to be carried out to the satisfaction of the farmer in the final analysis.

THE problem of a burned-out engine bearing being repaired in the field is no small one, particularly if clouds of dust are in the air making the repair all the greater. It is possible

that with the light type of tractor the automotive dealer may develop some form of wrecking truck and trailer by which the tractor can be lifted bodily off the ground onto the trailer and speedily conveyed to a nearby garage, where the bearing can be properly taken up without danger of damage to other parts of the engine and without serious loss of time.

UNQUESTIONABLY automotive dealers must develop some new form of service for the farmer with a tractor. Scraping the bearing is a careful bit of work when done in a good repair shop and by an experienced man. It is immeasurably more difficult when done in a dusty field under the most unfavorable conditions. It is questionable if it is possible to perform a proper job under such conditions. It has been done by experienced dealers and upward of 7 or 8 hr. have been needed for the job. The wise dealer, who is interested in seeing that his tractor gives a good account of itself, does not want such a repair job to be done by inexperienced farm help, as such work would only result in dissatisfaction and in the majority of cases give a black eye to the tractor in that territory.

AUTOMOTIVE dealers have a great educational work to do with the farmer in educating him into keeping his tractor in good operating condition before those periods of intensive farm work, such as cultivation on the farm for the spring crops, harvesting, etc. The time to overhaul a tractor and examine it to see that it is in A1 condition is before plowing is started or before the week when the wheat or other crops must be harvested. The stitch-in-time-saves-nine program must be employed. The farmer must not wait until the machine breaks down. It must be inspected, examined and, if necessary, repaired in advance. The automotive dealer has largely to handle this job. We can scarcely expect the farmer to do it, because the tractor will be a new machine with hundreds of them, and many of them have not been in the habit of repairing their motor cars before they break down, and we cannot expect them to take time by the forelock and repair the tractors before they break down. The automotive dealer must do this work.

PRESIDENT Kettering used other epigrams that should become classics in the farm tractor field. One was "Paint your instruction book on the tractor." The other was, "Chain the tools to the tractor."

THESE two epigrams epitomize two great lessons in tractor operation. When you metaphorically paint the instruction book on a tractor you automatically put before the operator a lot of advice that accomplishes a great deal of good and adds very little to the cost of the tractor. There is no reason why the number of times a part should be oiled could not be formed with a forging or printed on the casting when they are manufactured. There is no reason why a few words adjacent to a grease cup might not tell how often it should be turned down. These brief instructions can be carried out in a score of places and will serve as constant reminders of the attention they must receive. They cannot do otherwise than accomplish much good. In the early days of the motor car the French very frequently printed such instruction as "oil often" on certain parts that

should receive such attention. Although this instruction was printed in French it never failed to attract attention and undoubtedly saved many hours of needless delay as well as many dollars that might have been spent in needless repairs. What has been true in the motor car will be true ten times over in the farm tractor.

THE other epigram, "chain the tools to the tractor," is equally important as a time-saver. Nothing disappears so rapidly on a farm as wrenches and other tools. If these

CASE FOR THE N. A. D. A.

(Concluded from page 11)

and mechanics have become available for army purposes or for work in plants where such help is necessary.

A general closing of garages and service stations on Sundays, holidays and at night will release a large number of mechanics, but it will also reduce the earnings of the dealer who depends partly upon this branch of his business for his income. All of this has been done willingly and voluntarily upon the suggestions made by a committee of dealers themselves, after carefully investigating the dealers' business in an effort to determine what they could do to help the conservation program as originally outlined by the economy division of the War Industries Board.

Steps have been taken that will extend this work to all garages, accessory houses, oil stations, and in fact to every branch of the automobile business on the theory that such voluntary curtailment is a war measure which will represent a substantial saving of man power and material.

Therefore, within a short time, the automobile dealer industry will be upon a strictly war basis, fully as rigid if not more so than of any other industry, which evidences the fact that the automobile dealer is willing to do cheerfully anything that he can to help the cause.

Owing to the conditions confronting the factories whose product we sell and distribute, because of the scarcity of labor, difficulty of transportation, advance of prices and other factors of this sort, not the least of which is the fact that the automobile factories generally are doing a large proportion of war work, production has already automatically been greatly reduced. Therefore, any additional burden in the shape of taxation that will further curtail the manufacture of automobiles will place a tremendous hardship upon the automobile dealer. Especially is this true when the difficulty of delivery is considered.

Half Delivered Overland

During the past winter and spring and continuing up to the present time nearly half of the cars manufactured have been delivered to the various dealers and selling organizations upon their own power, thus relinquishing freight equipment entirely, this even to the extent of upwards of 1200 miles from the factory. Many driving deliveries were made as far away from the factories as Texas, most of the shipping done being to those dealers at points beyond the possibility of self delivery. As a further factor for the relief of transportation, automobile dealers generally favor and are heartily supporting the rural express and return loads movement and will probably be the biggest factors in its ultimate success, because with the establishments maintained in towns and villages through which these express lines pass the trucks in use for this purpose are assured of necessary mechanical attention wherever and whenever required.

In presenting the situation from the automobile dealer's standpoint, no attempt has been made to take into consideration and to cover the problem confronting the manufacturer himself, nor the disturbance that it will cause manufacturing organizations if a tax that will tend to curtail the manufacture and sale of passenger automobiles should be advocated, but is considered purely from the standpoint of the dealer,

who by the very nature of his organization is dependent absolutely upon the sale of a reasonable number of automobiles per year to properly maintain his establishment and to keep himself and his family.

Therefore, in considering the matter of an automobile tax, it is hoped that the dealers' standpoint will be carefully considered and that no measure be advocated that will tend to handicap his business so that he cannot continue to operate; also that due consideration will be given the fact that when he loses his source of revenue and livelihood, his ability to hold up his end in the purchase of bonds, donations to the many worthy causes that exist and his many other activities in this direction will be impossible; and also that as a class there is no bigger, broader and more patriotic group of business men in the country nor one who will more cheerfully help the government in every possible emergency than the automobile dealer.

FELTES SUCCEEDS HANCH

South Bend, Ind., July 1—N. R. Feltes has been elected treasurer of the Studebaker Corp., succeeding Charles C. Hanch, who has been placed in charge of the Automotive Products Section of the War Industries Board. Mr. Feltes has served eight years as assistant treasurer of the U. S. Rubber Co., one as treasurer of the Lozier Motor Co., and for the last four years has been vice-president and general manager of the Ames-Holden-McCreedy, Ltd., Montreal.

tools are constantly at the service of the person operating the tractor, the machine will be better cared for than if the tool box is empty. It very frequently happens that the lack of a tool results in a little derangement being permitted to go without repair. It results in a serious derangement and finally in a breakdown. Chaining the tools to the tractor largely eliminates the trouble. The phrase cannot be taken literally, but each manufacturer can work out to his best satisfaction how it is possible to take the greatest precaution with regard to tractor tools.

RECENT PRICE CHANGES

Chicago, July 1—The following price changes have been made:

	NEW PRICE	OLD PRICE
Chandler, 4-pass., 2 door.....	\$1,795	\$1,595
4-pass., 4 door.....	1,875	1,675
7-pass.	1,795	1,585
Coupe 2,395		2,195
Sedan 2,495		2,295
Limousine 3,095		2,895
Cole, 2-pass. 2,595		2,395
4-pass. 2,595		2,395
7-pass. 2,595		2,395
Coupe 3,795		2,495
Sedan 3,595		2,795
Comet, 7-pass. 1,685		1,285
Cunningham, 142-in. wheelbase	6,000	4,750
Kline, 2-pass. 1,595		1,495
4-pass. 1,595		1,495
5-pass. 1,595		1,495
Liberty, 2-pass. 1,485		1,385
4-pas. 1,485		1,385
5-pass. 1,485		1,385
Moon, 6-36, 5-pass. 1,395		1,295
4-pass. 2,250		1,985
5-pass. 2,250		1,985
Paterson, 4-pass. 1,495		1,295
7-pass. 1,495		1,295

Cadillac prices advanced to-day. All open cars are now \$3,220 instead of \$2,970; brougham five-passenger, \$4,090 instead of \$3,840; victoria, \$3,615 instead of \$3,365. The 125-in. chassis is \$2,690 instead of \$2,490; 132-in., \$2,770 instead of \$2,571; 145-in. \$2,810 instead of \$2,610. The town limousine is \$4,360; town landaulet, \$4,510; landaulet, \$4,495. The last three went up \$200. The limousine is \$4,395 now instead of \$4,145.



The crowds in London cheer Lloyd George as he motors to Parliament

Reorganizing Motor Transport Service

Officers Are Transferred—Army Takes Trucks as Fast as They Can Be Produced

WASHINGTON, June 28—A reorganization of the Motor Transport Service under Col. F. Glover is in process. Col. C. B. Drake, in charge of purchases, and Lieut.-Col. James Furlow, in charge of operations, have both been transferred to the General Staff of the Army.

Lieut.-Col. Edwin S. George, at one time Packard agent in Detroit, and recently in charge of motor trucks for the Signal Corps, has been transferred to the Motor Transport Service, succeeding Colonel Drake as chief of purchases under Col. F. Glover.

Walter White of the White Co., Cleveland, Ohio, has been appointed in charge of operations for the motor transport service under Colonel Glover. He takes the position vacated by the transfer of Colonel Furlow to the General Staff and will have charge of the operation of Army trucks in this country.

The newspaper reports to the effect that truck manufacturers have been requested to slacken on truck production because too many trucks were coming through in comparison to shipping tonnage, are untrue. The Army is taking military trucks as fast as they can be produced.

To Order More Trucks

It is reported, although not officially, in Washington, that the AA $\frac{3}{4}$ -ton standardized truck failed in the recent tests because of a weak frame and consequently has been discarded. The report says that the General Motors Co. truck No. 16 of $\frac{3}{4}$ -ton capacity has been substituted for the AA and will be known as the AA truck. Final decision on the A truck has not been made. The B, 3-ton standardized truck has, as was recently announced, been officially accepted as the standard army truck of that capacity. It is stated that 5000 of the AA trucks will be ordered shortly.

MAY PHOTOGRAPH AT NIGHT

Washington, June 28—An Italian invention permitting photography by night has been submitted to the Department on Military Aeronautics of the United States Army. It is claimed that excellent pictures can be taken of enemy positions from airplanes flying at a low height on moonlight nights and that the invention can be fitted to moving picture cameras, permitting photography of actual fighting, much of which takes place in the early morning hours.

Samples of the work of the new cameras give views taken by moonlight and by the light given by night flares. The pictures are clear in detail and when enlarged bring out features which would not be discernable to the naked eye.

Up to the present time one of the chief obstacles to be met by the aerial photographers was the fact that in the daylight flying the anti-aircraft guns forced the flyers to take pictures from a great height

and much of the detail of the enemy lines was lost. As one of the chief objects of photographing the enemy positions is to locate hostile camouflaged artillery, photographers frequently have been forced to take great risks in flying at low levels to achieve their aim.

It is held that flyers are in little danger from artillery when flying at night, and it is believed that the new device may result in greatly reducing the risks undertaken by the photographers of the Signal Corps.

UNSKILLED LABOR SHORT 300,000

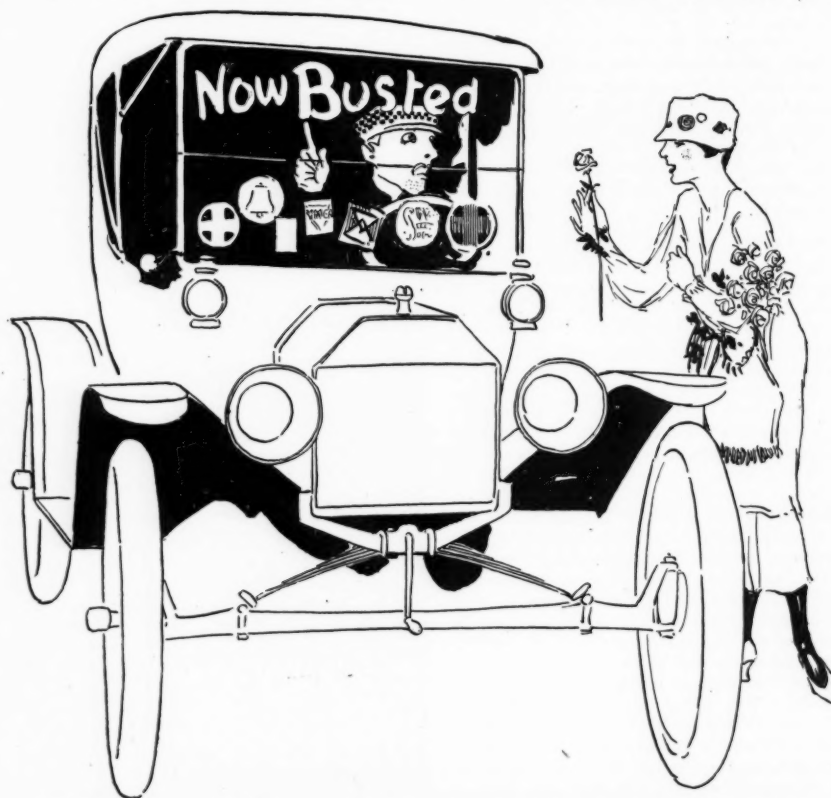
Washington, June 28—War industries of the United States are to-day short between 300,000 and 400,000 unskilled workers. The shortage of workers in the coal mining industries is said by the Department of Labor to be imperiling all other war production. The situation is considered so serious that the United States Employment Service, which assumes control of unskilled labor Aug. 1, is endeavoring to complete its machinery so that relief may be given even before that date. Skilled labor is also facing a serious shortage. One of the largest munitions plants, turning out heavy caliber guns, is short 2000 machinists. The war plants of Connecticut and Maryland alone face a shortage of 35,000 skilled machinists. The solution, according to the Department of Labor, lies in the recruiting by the United States Employ-

ment Service, of workers for war work from the non-war industries as quickly as possible. This work, as was told previously, is to be undertaken at the earliest possible moment by the United States Employment Service, which is increasing its offices to 700, throughout the country, and is adding greatly to corps of local agents and traveling examiners.

REGAL SOLD AT AUCTION

Detroit, June 28—The machinery, equipment and property of the Regal Motor Car Co. was sold June 26 by the Security Trust Co. acting as receiver for the company. The total assets of the company were listed by the receiver as \$1,137,140.82. In this was included some machinery which was later sold to the Government for \$41,000, about 5 per cent in excess of its inventoried worth. The balance was sold to Maurice Rothchild, one of the largest creditors, for \$500,000. The sale has not been confirmed by the court as yet. A petition has been filed requesting that an investigation into the company's affairs be made first and that a new receiver be appointed. It is charged that the Security Trust Co. is both receiver and trustee for the bondholders, the majority of which are Maurice Rothchild and J. B. Livingston, who petitioned for the receiver. This is the basis for the request that a new receiver be appointed. Many allegations regarding the management of the Regal company and its stock transactions are made in the petition which prays that the books be audited and the entire business of the concern be delved into. Official reports show the company to have been losing money since its reorganization.

It is alleged in the papers filed that at



Here is how one Ford owner met the situation: On the lower half of the windshield he put his string of Red Cross emblems and other tags for which he had contributed. Then he wrote in white soap, "Now Busted"

the reorganization of the company in 1913 the assets, amounting to \$2,773,083, were sold to the new company for \$2,600,000 by Fred W. Haines, receiving \$1,500,000 common stock and \$1,100,000 preferred stock in payment. This stock was later transferred, the preferred between Charles R. Lambert, John E. Lambert and Bert Lambert, and the common stock between the Lamberts and Haines. The Lamberts, Haines and Harold M. Emmons, lawyer and member of the law firm now acting as attorneys for the receiver, were elected directors of the company.

NEW YORK TRACTOR SCHEDULE

New York, June 29—The New York State Food Commission, which staged a tractor demonstration at Watkins, N. Y., June 26 and which is to stage a series of such demonstrations throughout New York state, has definitely decided on the dates and places, which are as follows:

July 4, Stanley, Ontario County.
July 13, Auburn, Cayuga County.
July 27, Syracuse, Onondaga County.
Aug. 6, Fulton, Oswego County.

Each demonstration is to start between 10 a. m. and noon and continue through the afternoon. Each machine will be allotted a plot of ground which is to be plowed and fitted. There will be no competitive tests, the demonstrations being entirely educational in character. It is expected that nearly a dozen different makes of tractors will be in operation at each demonstration.

CHALMERS-MAXWELL DEALERS ONE

Chicago, July 1—The C. E. Fay Co., Boston distributor of Maxwell cars and trucks, and the Chalmers Motor Co. of New England, Chalmers distributor, have combined. The new organization will be known as the C. E. Fay-Allen Co. and will distribute Chalmers and Maxwell cars in Maine, New Hampshire, Vermont, Rhode Island and Massachusetts.

Fordson Tractor Contracts Total 13,463

Ten States Alloted 1000 Machines Each—5067 Had Been Delivered June 22

DETROIT, Mich., June 28—There has been so much speculation of late and so many rumors with regard to the distribution to date of Fordson tractors throughout the different states that have been purchasing them that MOTOR AGE has made a complete check-up on the number of tractors sold to the different states, together with the number delivered to date and the dates on which deliveries are to be completed.

This shows that the total number contracted for to date is 13,463, the list showing that ten states have contracted for 1000 machines each, these being Michigan, Ohio, Iowa, Minnesota, Illinois, Indiana, New York, Kentucky, New England and Maryland and Delaware. The six New England states have ordered 1000, Maryland and Delaware combined have ordered 1000. On June 22 there had been delivered 5067 tractors to these states. The tabulation does not include Fordson tractors delivered to England or France, although deliveries to Canada, South America and Cuba are included.

MORE CAPITAL FOR FORDSON

Dearborn, Mich., June 28—Henry Ford & Son, Dearborn, Mich., have increased their capital stock from \$1,000,000 to \$5,000,000.

BLOOMINGTON FIXES WAGE SCALE

Bloomington, Ill., June 29—A strike of the mechanics and helpers of the Bloomington garages and motor car repair shops was adjusted after the men had been out a week. This was one of a series of strikes, nearly all lines of industry being affected.

Bloomington is to entertain the Illinois state federation of labor convention this fall and organizers have been working here for the last month, endeavoring to unionize every line of trade prior to this gathering. This has resulted in general misunderstanding and for a time the situation was serious. Nearly every line has settled the controversy. The patriotism of the employees was appealed to, and the importance of conservation on account of the war was a factor in arranging a settlement.

The terms of the settlement fix 9 hr. as a working day, overtime to be paid for at the rate of time and a half, including Sundays and all holidays. Apprentices are subject to the same shop rules as mechanics. They must be between the ages of sixteen and twenty-one and serve four years of 290 days per year before qualifying as mechanics. All competent mechanics with four or more years of actual repair shop experience will receive 55 cents per hour. Apprentices will receive 20 cents per hour and an increase of 2 cents per hour for every six months until four years have been served. Shop helpers will receive a minimum of 35 cents per hour. Floor men, washers and night men were given a 10 per cent increase in pay. The employer is given the right to reduce the hours or working force as the necessity of the business demands.

FRUITS OF DAYTON EXHIBITS

Washington, June 28—The rumor-killing meeting of the Society of Automotive Engineers, held in Dayton last week, is having its results in Washington—where it is most sorely needed. The false reports of the Liberty airplane engine already are being nailed. Those who attended the meeting and saw for themselves the real Liberty engine design and the plane production in the Dayton-Wright factory are telling their Senators and Congressmen the truth. One letter written by B. M. Kent, a Cleveland, Ohio, engineer and patent lawyer, to Congressman L. C. Cramton tells in detail the wonders of the Liberty engine and its present quantity production. Mr. Kent wrote to the Congressman that the Packard Motor Car Co. is turning out twenty-five Liberty engines per day, Dayton-Wright, sixteen to twenty fighting planes per day, Lincoln Motor Co., eleven engines daily and Cadillac five to six per day. Ford, he stated, will be in production shortly as will the Nordyke & Marmon Co.

The engine is described as being at least in the first rank. Comparison of it with the best English, Italian and German engines is made. Mr. Kent told further of the flying tests he observed and how the machine with the Liberty engine in it was off the ground in less than 7 sec., passing the 1000-ft. latitude in 46½ sec., and reaching 7000 ft. in 6 min. 40 sec.

Delivery of Fordson Tractors

State	Number contracted	Number delivered	When delivery will be completed
Michigan	1,000	552*	Order cancelled
Ohio	1,000	749	July 8
Wisconsin	500	386	July 8
Iowa	1,000	504	July 8
Virginia	200	133	July 8
Kentucky	1,000	133	Indefinite; ship three cars week
South Dakota	200	42	As soon as possible on account of wheat harvest
Nebraska	200	50	
Minnesota	1,000	131	
Oklahoma	200	14	August
Illinois	1,000	111	September; ship four cars week
Indiana	1,000	401	July 15; ship one car week
New England	1,000	102	
Arizona	63	7	
Florida	None	14	
Georgia	None	7	
Idaho	None	7	
Kansas	200	84	
Maryland and Delaware	1,000	None	Three months
New York	1,000	166	August
North Carolina	100	19	Thirty days
South Carolina	100	7	Thirty days
North Dakota	500	59	Aug. 30
Tennessee	100	85	Few days
Cuba	100	13	
Canada	1,000	1,073	Expect to complete orders next week. Amount to 1129
South America	None	7	
Connecticut .....	.....	7	
Massachusetts .....	.....	62	
Rhode Island .....	.....	28	
Vermont .....	.....	5	
New Hampshire .....	.....	0	

*Distribution in Michigan continued through agents after state cancelled order; 763 Fordsons now delivered in Michigan.

"We Treat 'Em Rough"

The Tank Corps, Aristocracy of America

By Allen Sinsheimer

IF you are one of the mental and physical aristocrats of American citizenry—if you are the owner of a sound body, a clear head, an executive, mechanical mind—if you seek vigorous service—if you want to ride to Berlin instead of walk—if you want to do the utmost damage to the Hun—join the tank service—it will give you experience, rank, training and excitement to your heart's content.

The aristocracy of the United States army—the Tank Corps—is in the making. It still requires 3000 tractor drivers, heavy truck drivers and motor car engine mechanics who have physical strength, mental strength and executive ability—men without a single physical defect, who can think quickly and clearly and if need be, think for others. These men can be from eighteen years to forty-one years of age. They must be men—

Who are eager to show the Hun what real American man to man frightfulness comprises.

Who can stand three days of service in tanks out of every nine days.

Who can laugh at gas attacks and at the fumes of the powder gas and tank engine.

Who can maintain their mental poise while their bodies are racked by the sliding, twisting, jolting and dropping of the tank as it works over the battlefields.

Who can keep cool in the intense heat of the tank, hotter than the boiler rooms of a battle ship.

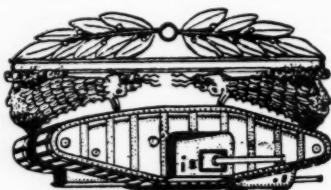
Other Requirements

Who can concentrate their efforts efficiently despite the thunder of the machine guns, the tractor tracks, the engine and the rattle of the enemy fire against the tank.

Tank service—they call it "treat 'em rough" service—is the most vigorous one of military work. The Tank Recruiting Division makes no effort to withhold the strenuous duties of its personnel from possible recruits. Men who enter the tank service must come knowing of how vigorous their duties will be.

The soldiers of the tank service are asked to stay in the tanks at the battle-front but 2 hr. at a time. To work beyond that is a physical impossibility for the average sound man. For this reason those in the tank service, which offers many great opportunities, constitute a personnel that can well be called the aristocracy of the United States army. Every member is physically and mentally capable. Every member must be versatile. He must be able to direct the tank if necessary. He must be capable of making quick repairs on either the engine or the machine gun when occasion demands. He must have the nerve to substitute one barrel after another on the machine gun as the barrels are shot away by enemy fire. Even so slight a defect as dependence upon eye glasses rejects the applicant for tank service.

Opportunities offered in the tank work include practically a vacation for six days



Insignia of the Tank Corps

out of every nine, during which time the men do light work behind the front. They include officerships, both non-commissioned and commissioned, to practically every member. In fact if a tank corps recruit does not become at least a non-commissioned officer within sixty days after his acceptance, he is not considered fit for this service. There are two officers to every first-class private in the tank division. The division is in its infancy. It will expand and every man who joins to-day is certain of officership if he makes good. No commissions are granted to any one in the tank service who enters from civilian life. Every commissioned officer excepting a few well qualified who have been transferred from the Engineer Corps has been drawn from the ranks.

There are two classes of tank service. The light tank service includes military duty in the light tank with two men, a sergeant commander and a corporal driver. In this tank the driver operates the gas engine and the commander operates the machine gun, but both men must be sufficiently well versed in mechanics to be able to take the other's place if necessity demands. The heavy-tank service comprises a personnel of eight men, one commissioned officer commanding, one sergeant driver, and six machine gun operators of

non-commissioned rank. There are four guns in the heavy tanks which can be trained at one time, four of the machine gun operators shooting the guns while two act as ammunition passers.

All members of the tank service are given training in wireless operation—giving them an excellent trade after the war. Wireless is not now used for signaling on tanks, but inventions are under way which will allow for this service. At present painted shovels are used for signaling. One color of shovel means one thing, another color another, and the various motions given to the shovels add to the meanings.

Recruits for tank service can apply, if of draft age, to their local boards, and, if under twenty-one and over thirty-one, to any United States recruiting officer, or they may apply directly to the chief recruiting station at Washington by filling out the enlistment blank reproduced here and mailing it. Included with the application must be an informal report by a United States recruiting officer as to the mental alertness and physical fitness for tank service. The report blank printed here can be used by the recruiting officer.

The Tank Corps concentration camp is located at Gettysburg, Pa., and is called Camp Colt. Preliminary training is given there and is followed by overseas training and subsequent service. In the past the training on this side has been brief, about one month with four months training in England. Tank officers, however, have returned to this country and will lengthen the duration of training on this side to three or four months with but one or two months of training in England.

The monthly pay of the enlisted personnel for the tank service is as follows:

INFORMAL REPORT ON

Physical Fitness and Mental Alertness of Applicant for Service in Tank Corps, National Army.

NOTE: This informal report should be accomplished by the nearest United States Recruiting Officer, and mailed by him to the Director of Tank Corps.

Inasmuch as the report WILL NOT BE RETURNED to the Applicant by the Examining Officer, it is necessary that the application for service in the Tank Corps, N. A., together with the required recommendatory letters be attached hereto, upon appearing for examination.

....., 1918.

From:

To: The Director of Tank Corps, N. A., Mills Bldg., Washington, D. C.

Subject: Informal Report and Recommendation upon

(Name)

Height Weight

Right eye Left eye

General condition of teeth General physical appearance

Remarks

(Dependence upon glasses is prohibitive to Tank Corps service.)

In the understanding that the Tank Corps requires a personnel combining mental alertness, with a high degree of physical fitness, I do not recommend* acceptance of the attached application. The physical condition of the applicant apparently qualifies him for military service without limitation.

(Signed)

* Strike out one line and encircle the selected suggestion, to avoid error.

Strike out "strongly" if candidate apparently qualifies, yet has not the personality necessary to leadership of men.

—Reproduced by MOTOR AGE.

Grade.	In U. S.	A. E. F.
Private.....	\$30	\$33
First class private.....	33	36
Corporal.....	36	40
Sergeant.....	44	51
First class sergeant.....	51	60

Members of the tank corps are also entitled to the additional allotments if they have dependents, which amount to \$15 a month for a wife, \$25 a month for a wife and one child, \$32.50 a month for a wife and two children, \$37.50 a month for a wife and three children, \$42.50 a month for a wife and four children, \$10 a month for a parent.

U. S. ASKS LABOR SURVEYS

Washington, June 28—All war industries have been asked to estimate their requirements in unskilled labor for the next ninety days by the Department of Labor, United States Employment Service Division.

At the same time the Employment Service has started a collection of statistics of the unskilled labor reserves in their state. When the estimates of employers and the supplies available are both received, the Employment Service will prepare its allotments of quotas of such labor, which each state will be called upon to furnish for war work. All workers not engaged in essential war work will be included as unskilled.

TO LINK THE CAPITALS

Indianapolis, Ind., June 29—E. G. Baker left here Wednesday night on a capital-to-capital test trip in a Revere car, which is the design of three racing drivers, Gil Anderson, Tom Rooney and Adolph Munson, and which was described in MOTOR AGE Feb. 28.

Baker expects to average 150 miles a day. He has made many long trips overland, among them the transcontinental, 3471 miles, seven days 11 hr. 52 min.; Chicago-to-Indianapolis, 196½ miles, 3 hr. 42 min.; Detroit-to-Indianapolis, 314 miles, 7 hr. 10 min.; Columbus-to-Indianapolis, 170 miles, 3 hr. 32 min.

GARABED CLAIM IS CONTESTED

Washington, June 28—E. C. Kilpatrick, San Francisco, Cal., who is in Washington, claims that Garabed T. K. Giragossian, who will give a formal test of a new "free energy" before scientists in Boston Saturday, has the same generator which he designed sometime ago. He charges that more than a generation ago he made important discoveries as regards ether and electricity; that after spending more than \$20,000 of his personal funds on experimentation, he evolved the "compound motor generator," which, he claims, will revolutionize industry and accomplish all that has been claimed for "Garabed."

March 27, 1916, Mr. Kilpatrick filed with the Patent Office, in this city, application for a patent under Serial No. 86957, "for method and apparatus for converting electrical energy into mechanical power."

Mr. Kilpatrick claims that Giragossian did not secure a patent for his "Garabed energy" because he would be forced to make affidavit to the effect that he had discovered or invented the generator. He describes the free energy machine as being a compound motor generator with a double armature with two commutators,

Form C-2—Printed in MOTOR AGE

APPLICATION FOR SERVICE IN TANK CORPS, NATIONAL ARMY

In order that this office may judge your suitability for this organization, please fill out the following form LEGIBLY in INK and return to The Director of Tank Corps, Mills Building, Washington, D. C., through the Recruiting Officer.

This form, while not committing the applicant to service in the Tank Corps, should not be presented unless a sincere desire for such service prevails.

Date....., 1918.

Name.....
(Print in capitals) (last) (first) (mid.in.)
Address.....
(Street and number) (City and State)
Age..... Date of birth..... Color.....
Nationality..... Where born.....
Draft classification.....
Do you speak French or German?.....
Occupation or trade.....
Number of years' experience.....
Education..... Present salary.....
Present position..... How long held.....
Previous employment.....

If you are experienced in any of the following, state the extent of your experience, giving full particulars:

- 1—Machine gun mechanic.....
- 2—Lathe hand.....
- 3—Bench machinist.....
- 4—Machine designer.....
- 5—Oxy-acetylene welder.....
- 6—Auto engine mechanic.....
- 7—Blacksmith.....
- 8—Auto electrician.....
- 9—Auto chauffeur.....
- 10—Tractor driver.....
- 11—Telephone operator.....
- 12—Storekeeper.....
- 13—Heavy auto truck driver.....
- 14—Motorcyclist.....
- 15—Topographer.....
- 16—Wireless buzzer operator.....
- 17—Telegraph operator.....
- 18—General clerk.....
- 19—Stenographer.....
- 20—Typist.....
- 21—Cook.....

If you are a registrant under the Selective Service Law, a statement from the Local Board MUST be furnished showing your number is so low that you are not in the current quota of the Local Board.

It is desired that you submit two letters of recommendation with this application.

REMARKS:

Under this heading amplify any of the items on which you wish to lay special emphasis. If necessary, a separate sheet of paper may be used for the purpose, referring to the numbers.
(Signature).....

into one of which the negative current is fed. The positive current is fed into the other, thereby using the full power of repulsion of both currents. The armature revolves two upright shells, the field in

each being charged alternately with positive and negative electricity, arranged to harness the full power of attraction of unlike charges and the full power of repulsion of like charges. The feed of both currents of the dynamo into the double armature is said to double the power of the old method. It is claimed that this machine has four times the leverage of the old-type motor which gives eight times the power, which is again quadrupled in each shell, giving eight times eight, or sixty-four, times the power of the old method.

The machine is started by a small storage battery. Proper lines and shunts are set through a double starting box to feed the armature and fields. A positive current from one busbar is fed into the commutator and an equal negative current from the other busbar is fed into the other commutator. The fields are charged individually and literally with positive and negative charges direct to each. As these currents are turned on from the plant's own production the storage batteries are turned off and the machine not only perpetuates its own motion, it is claimed, but can be set to produce from sixteen to 400 times more power than it takes to run itself, which can be used for other purposes.

Mr. Kilpatrick will set up a machine for demonstration in Washington as soon as a suitable location can be found.

EASTERN PLANE PLANTS VISITED

Washington, June 28—Members of the Senate aircraft investigating committee are not as enthusiastic over eastern aircraft plants as they were following the inspection of those in the Middle West. The committee returned Saturday after visits at Princeton, New Brunswick, Elizabeth and Plainfield, N. J., and Long Island City, L. I. It was said that while the plants inspected are beginning to reach a quantity production, conditions are not entirely satisfactory. Details will not be made public until the complete report is filed several weeks hence.

The committee will visit Langley Field, the army aviation station near Hampton, Va., this week and afterward will conduct hearings in Washington.



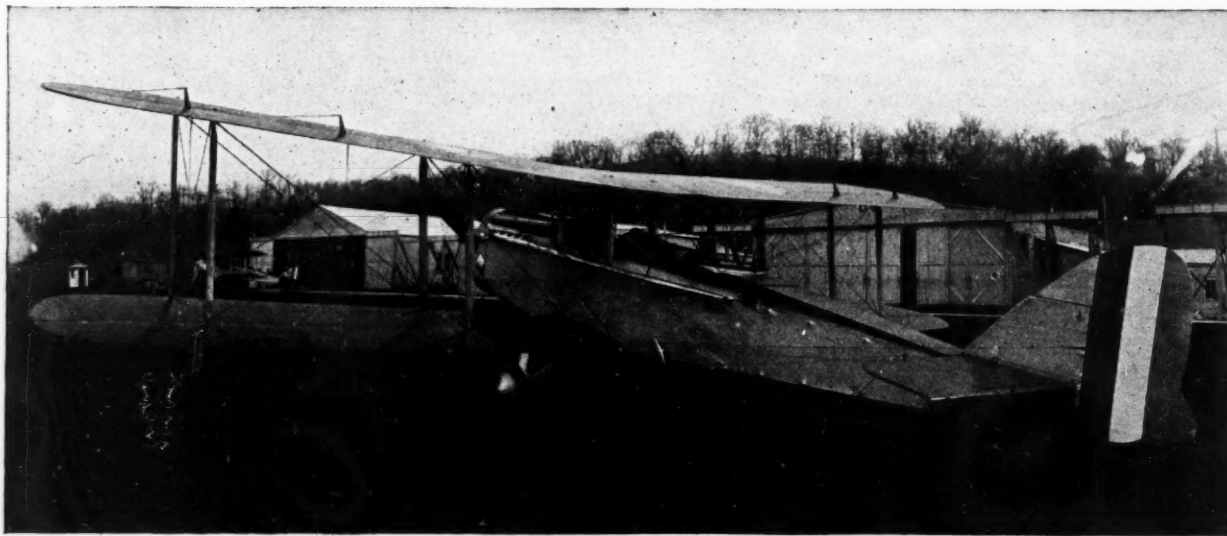
E. G. Baker in the Revere starting on his capital-to-capital test trip

Airplanes of Today

Resume of Developments in Flying Machines from Earliest Times to Present Models

By Fay L. Faurote

Paper Read Before Summer Meeting of Society of Automotive Engineers



A battleplane which was built in the United States, model DH4

WHEN the Wright brothers, on Dec. 17, 1903—only fifteen years ago—startled the world by their short but successful flight in a heavier-than-air machine, the most prophetic of us little knew the development that the next fifteen years would bring. The war came, and with it an accelerated progress, such as an industry has never known before, a mechanical activity of the most exciting sort, a marvelous awakening of invention, a speeding up of manufacture almost unbelievable; for, despite what our critics say, huge steps have been taken, and still larger ones are in process to-day. The art of aviation has thrown off its swaddling clothes.

A Far Cry

From the frail framework of the Wrights', with its little 16-hp. engine, to the giant Handley-Page, Caproni and Curtiss flying-boats is a far cry. Only a Jules Verne could have imagined or foreseen such an astounding development. War is a hard master, a driver of men and minds, a quickener of invention superlative. To what an extent it has hastened aeronautical development can best be realized by a survey of the hundred years preceding this century.

Literature shows us that as far back as the Prophet Isaiah men were thinking about a way to navigate the air. About the year 1500 Leonardo da Vinci and Jean-Baptiste Dante, contemporaries of Columbus, are said to have given serious consideration to the problem of flight, and Dante is credited with having made a successful glide over a lake on a pair of bird wings which he had made after designs of his own.

Men of all ages have looked up into the

air and wondered how and when they would be able to navigate it. But until fifteen years ago they did not know how. Limitations in their conceptions of time and space prevented them from solving the problem. But now, both time and space, with their attendant dimensional attributes, which are but mortal concepts, are slowly being eliminated as man wakes up mentally. Inventive genius is gradually cutting down the one and decreasing the relative effect of the other. As has been the case with all other forms of progress, however, the world is loath to accept the new. The practicable plan of a real inventor is looked upon as a fanciful distortion of a disordered mind, and the earthly limits within which the public mind has been content to move give way only under the forced pressure of demonstrated design and practical operation.

It is a curious but natural coincidence that aeronautical development has in all ages followed, or has been accompanied by wars, or other great mental awakenings. For instance, da Vinci and Dante lived at the time when Columbus discovered the new world. Sir George Cayley, in 1809, made a large glider and with it formulated many laws of equilibrium and control. He was at work during the war of 1812. Henson, Stringfeller, Wenham and Bulton—a quartette of experimenters who also made many valuable contributions to the art of aeronautics—were active just previous to and during the War of the Rebellion. Later, M. Ader in France, Sir Hiram Maxim in England, and our own Prof. Samuel P. Langley—then at the head of the Smithsonian Institution—were conducting scientific investigations, and making valuable experiments on machines during the

Spanish-American War. This activity culminated in the successful flight made by the Wright brothers in 1903.

From that time until the beginning of the Great War some progress was of course made, but it is probable that had not the demand been greatly stimulated by the necessity of the Allies and Central Powers, we should still have only small planes of limited power, carrying capacity and radius.

The strategic value of an airplane, however, quickly brought aerial development to the fore and artificially stimulated experimentation, development and manufacture, first in Europe and then in the United States. The discovery that Germany had for years been planning the building of giant Zeppelins, making aerial maps, designing and building airplanes and every aerial device connected with their use, shocked the rest of the world into the realization that if it were to compete successfully with Germany it would be necessary to build machines of large carrying capacity, of a speedy character and wide cruising radius. The internal combustion engine, brought to a comparatively high state of development by its use in the automobile, rendered this possible.

Ten Years Ago

To really appreciate the problems which five years ago engineers were called upon to solve, it might be interesting to take a look for a moment at the situation ten years ago—say in 1908—when most of the American flying machines were in a "featherless state," so to speak; when aside from a few exhibition flights, little of commercial value has been done. The Wright brothers, Glenn H. Curtiss, Chanute, Dr. Alexander Graham Bell, Capt.

Thomas Scott Baldwin, Lieut. Selfridge, J. A. D. McCurdy, Charles Manly, and a few other pioneers, were all busily engaged proving the truth of their theories. The Wright brothers had met with some commercial success, and at military trials had demonstrated the worth of the airplane as a fourth arm of the service, thereby gaining Government recognition. Curtiss and Baldwin had made dirigibles and airplanes and flying boats of various shapes and sizes. The Aerial Experimental Association had built three biplanes, the last one of which, the "June Bug," at an official trial arranged under the auspices of the Aero Club of America, made the first publicly advertised flight, in July, 1908. The machine successfully flew 2000 yd. over an S-shaped course at a speed of 39 miles an hour.

Later, Curtiss made his famous flight down the Hudson from Albany to New York in one of his biplanes. As most of us no doubt know, there are few landing places between Albany and New York City. One was found near Poughkeepsie which Curtiss used on his way down. Fearing that perhaps he might not be able to choose a landing place, and being unwilling to have his machine smashed on the rocks, he had sometime before conceived the brilliant idea of putting on, in addition to his wheel-landing gear, twin pontoon-floats, so that if worst came to worst he could land on the surface of the Hudson river. He said he always had a feeling that water might be safer to land on than the earth, and that at least he could land on the water without a bad smash-up if he had to.

Forerunner Called Triad

This machine, which he called "Triad," is, therefore, interesting as a forerunner of the hydroaeroplane and flying boat, both of which developments he later carried out to a successful conclusion. On Lake Keuka and on the smooth waters of the Spanish Bight just inside San Diego harbor, he developed the flying boat and hydroaeroplane. It was here that he also came in contact with Army and Navy. Foreseeing the value of the airplane for Army and Navy work, he invited officers to be sent to his camp for training, and so during the winter trained many of the Army and Navy flyers who to-day are di-

recting the destinies of our aerial forces upon the world through the eyes of His. It was here also that he flew from land out to a battleship, landing alongside in the water, was hoisted aboard, dropped overboard again, and flew back to land. A year before Eugene Ely had succeeded in flying from land, in a land machine, and alighting on the deck of a battleship. It was at this time that both the Wright brothers and Curtiss demonstrated the possibility of aerial bomb dropping, and predicted the remarkable part that airplanes would play in any future conflict in which the world might become involved.

On all these early machines, the pilots sat in an exposed position. Little attention was paid to resistance and streamlining, and because of the fact that most of the machines were pushers, it was necessary to put the radiator well up to the front and between the wings and put the pilot and his passenger forward. Control systems were more or less fragile and unmechanical pieces of apparatus, designed to suit the purposes of the individual pilot. No attempt, of course, had been made to standardize them or to work out similar movements for controlling the various surfaces.

Landing gears differed materially as did the methods of getting off. The Wrights used a form of pylon and counter-weight for launching their machine from skids.

The body or fuselage was not inclosed, the struts were not streamline, neither was the landing gear. The rudders were crude affairs, and the wing-panels, judged by the standards of to-day, were flimsy things of cloth and sticks.

All praise to those brave men who risked their lives for the development of aviation! To the Wright brothers—who in spite of all odds, laughed at by friend and foe alike, at last had their efforts crowned with success, and from comparative obscurity placed their name, and that of Dayton, upon the lips of the world—I wish to pay tribute. To me there is always in the character of every pioneer a certain something which inspires a feeling of awe; a certain far-away look, a prophetic cast of the eye almost childlike in its expression, that removes him from the crowd and causes him to be marked among men.

It were as if God himself looked out

chosen few—inventive geniuses, reformers, great minds, they are; where do their ideas come from, where indeed, if not from Divine Intelligence? Surely no human hand nor mind has trained their cunning; given them their starting point, perhaps; but what of their prophesies, their enlarged views—these alone must come from Above. They are the ambassadors of Spirit, so to speak, the human mouthpieces of Divine Mind, the wideners of the vision of life itself. As such they can no longer be considered as individuals, beholden only to themselves; they are the property of the world, the hostages of society, the almoners of inventive gifts for which the world can never adequately repay them. Modest to a degree, the true genius seldom realizes his mission, nor claims his own until the world, awake at last, honors, alas, sometimes, too late to be of any real benefit to him. History alone develops the true greatness of his discoveries and grants to his memory the fitting crown of unselfish success.

And now just a few words about the theory of flight. Many models and forms of airplanes have been studied, many experiments performed. The theory of flight is fairly well known, so that definite results can be predicted from certain known conditions. Scientists and mathematicians have interested themselves in this branch of the engineering art, and M. Eiffel, Lan- chester, Zahm, O'Gorman, Hunsaker, Klemin and others have made many valuable contributions of facts upon which aeronautical design now rests securely. This scientific research has revealed many seemingly strange things.

Lifting Force of Air

Few people, for instance, know that about 66 per cent of the lifting force of the air is due to the suction on the upper surface of the wing panel, while only about 33 per cent can be credited to an actual pressure of the air on the under surface. It is also a significant fact that the amount of force required to move a small wire through the air is as great as that required to move a streamline strut several times its diameter. The influence of the streamline was formerly little understood and seldom taken account of in the design of struts,

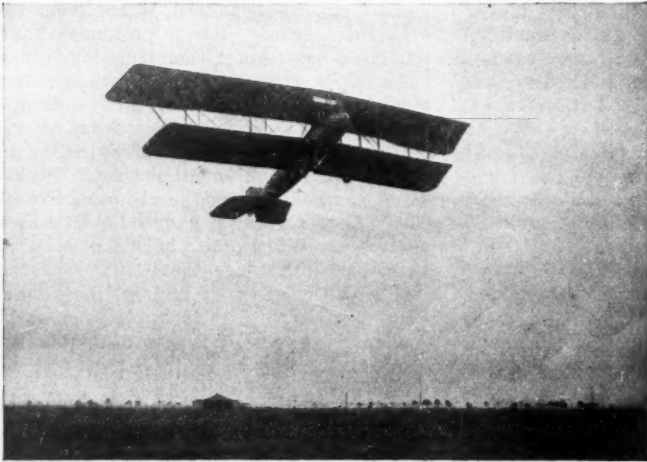


The English pusher FE 26

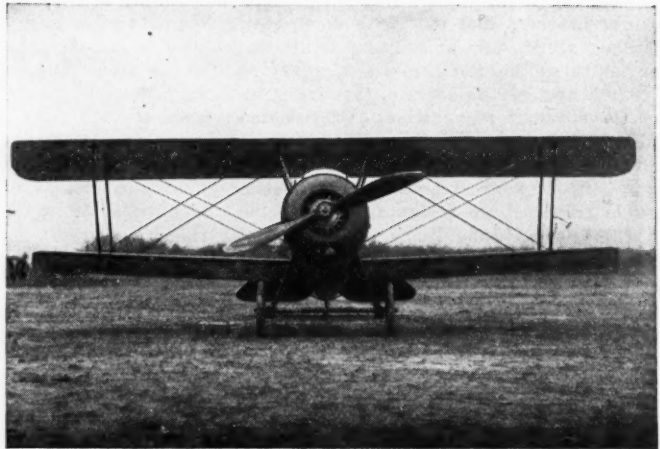


The American L. W. F. plane

Some of the American and Foreign Plane Types



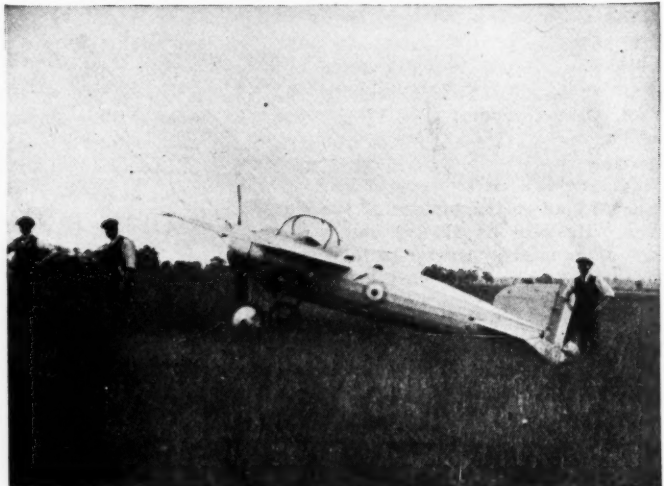
An American plane, the L. W. F.



The Thomas Morse S4C scout, American



Front view of an English monoplane, the Bristol



Side view of an English monoplane, the Bristol



Another American, a Curtiss model L triplane



Another English plane, the Sopwith fighter

body and landing gear. Scientific experimentation, however, revealed the necessity of cutting down head resistance, thus decreasing what is known as the drag, or drift. It indicated the necessity of changing the surfaces, the cross-section of the wing panels, the sections of the struts and other exposed surfaces, to forms which would offer less resistance.

It is easy enough to push a thing into the air but it is hard to get it out without creating a disturbance. If we take a broom handle, for instance, and sweep it through the air rapidly we find, if we

could examine the air immediately following it, that a small vacuum is created just back of the stick itself and that eddying occurs right behind it, creating a V-shaped partial vacuum which decidedly increases the total power required to move the stick through the atmosphere. It was early found by experimenters that by filling up this vacuum, and changing slightly the entering surface, that the stick could be passed through the air much more easily; a considerably smaller amount of power would be required to move it.

Now, when we design an airplane we

know before it goes up into the air almost exactly what it will do. We know, for instance, that a certain type of wing-form has certain characteristics; one is good for weight carrying, another for speed, still another seems to combine successfully several desirable characteristics. Investigators have also discovered that there is what is known as an end-wash on a wing panel and that this can be eliminated by cutting off the corner of the panel.

Most American and Allied machines use that type of panel in which the end edges form an angle, the apex of which points to

the front of the machine, but Bleriot has used a type of panel in which the angle formed by the end edges points to the rear of the machine. Both types of panels have shown good performance. This latter type of end section is known as the Bleriot end. The angle at which the wing panel meets the air is another subject of wide interest. The angle of incidence, for instance, which is the angle between the direction of flight and a tangent drawn through the lower surface of the wing panel, may be varied with interesting results.

Of course, the whole object of all this work is to decrease the drift, or drag, and increase the lift—in other words, to secure a large lift drift, or efficiency ratio. Drift is always concomitant with lift. Drift is a measure of the waste energy that is spent in order to accomplish work. We cannot get lift without drift. Lift is a measure of the effective work, and drift is a corresponding measure of the amount of work which is absorbed or lost at the expense of which we get the lift.

General Types

Other observations are: A biplane is about 82 per cent as efficient as a monoplane of the same total surface if there is no stagger in the biplane arrangement. A triplane is about 60 per cent as efficient for the same wing area. A monoplane has 1.22 as much lift as a biplane and 1½ as much lift as a triplane. A biplane has 1.36 as much lift as a triplane. All of these ratios are on the basis of equal areas. The effect of stagger is to increase the efficiency of a biplane from 82 to 87 per cent, depending upon the stagger. For general purposes an aspect ratio of six is used. Fast racing machines usually have an aspect ratio of about six. For slower, weight-carrying machines, an aspect ratio of about seven or eight is used. The aspect ratio of the JN-4D is 7.3.

Modern airplanes may be divided into the following general types:

(1) **Combat Machines.** These are small, very fast, single-seater fighters, used for scouting purposes. They usually have wing spread of from 20 to 25 ft., a speed of 125 to 135 m.p.h., carrying capacity of 450 lb., and a climbing speed of 10,000 ft. in from 8 to 12 min. The Spad, Nieuport, Morane, Curtiss-triplane, SE-5, Sopwith, Dolphin and Iserman Albatross single-seater are examples of this type.

(2) **Reconnaissance and Photograph Machines.** These are slower-flying machines intended for reconnaissance and photographic work. They are used for artillery spotting, map making and general reconnoitering. The wing spread is usually from 40 to 60 ft., and the speed from 80 to 100 m.p.h., the carrying capacity from 800 to 900 lb., the machines being two or three seaters and having a climbing speed of 10,000 ft. in 12 to 25 min. Examples of this class are de Havilland, Bristol, Curtiss, Voisin and Farman.

(3) **Battleplane.** The battleplane is a two or three-passenger machine driven usually by one large or two fairly good-sized engines and equipped with a number of machine guns and sometimes with a cannon. It is a moderately fast machine, making from 70 to 85 m.p.h. The Voisin is a good example of this type. It is credited with carrying a one-pounder.

(4) **Bombers.** These are of the same general type as the reconnaissance machines but slightly larger. They vary in size from 45 to 90 ft. in wing spread and carry from two to twelve people in addition to their war load of bombs and fuel. Their speed is from 75 to 100 m.p.h., their radius of operation from 500 to 1000 miles, and their climbing speed 7000 ft. in 30 min. Examples of large bombers are: Handley-Page, Caproni, Breguet, the Caudron, a twin-engined French machine, the German Gotha, the Friederichshafen, the German AEG and the big Curtiss boats. Machines that have been used for day-bombing and other purposes, but have lost their "pep" in remodeling many times are used for night-bombing.

For naval work, flying boats and hydro-aeroplanes of various sizes are used. On account of the weight of their hull, or pontoons, these machines compare favorably with reconnaissance machines traveling at as high speeds as 90 to 100 m.p.h. Used for coast patrol work and for naval observation purposes, they operate from stations on the coast, battleships or motherships that accompany the fleet. Hydroaeroplanes are similar in construction to land machines, except that in place of the landing-gear, single or double pontoons are fitted below the wings so that the machine may rise from or alight on the water. Most hydroaeroplanes are lighter than flying boats. For that reason, where a craft is desired for inland water work or for short scouting trips, the hydroaeroplane is con-

sidered by many to be a very desirable type. Unlike the land machine, it is not necessary to fly high in order to pick out a suitable landing place; one can land on the water almost anywhere. For larger sea voyages, however, especially when it is necessary for the craft to remain for some time away from its base of supply, a more seaworthy type of hull is necessary. The large 92-ft wing-spread flying boats, which the Curtiss company has built in large numbers, are good examples of this type. These boats have a wingspread of about 90 ft., are about 46 ft. long, and have a hull shaped very much like a sulphur-bottomed whale. The hull is 42 ft. long, the inside is electric-lighted, completely equipped, and so arranged that one can move about comfortably. A boat of this size will carry a little more than 2000 lb. I have been told by English officers that this boat has given a good account of itself, and that a large number of pilots have been decorated for their splendid work in attacking and downing Zeppelins in the Channel.

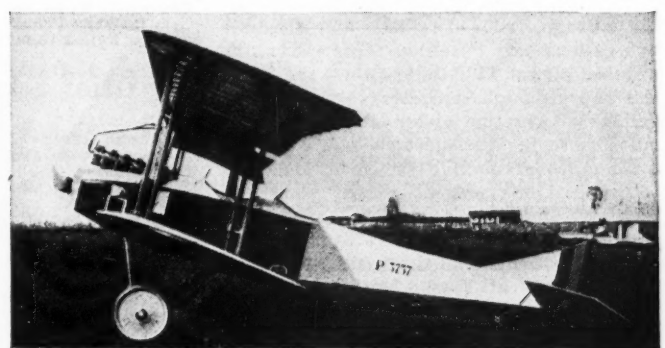
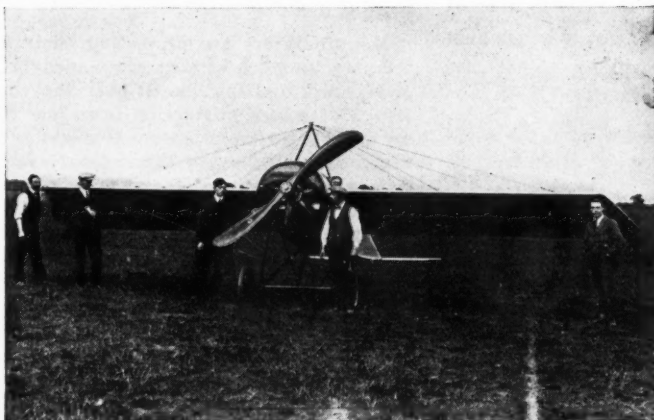
American manufacturers are not standing idle as some people seem to think. There have, of course, been many discouraging delays—many of which might have been prevented, many of which could not. I believe, however, that we are now fairly well on our way to good and continuous production.

America Not Idle

Americans are known as great manufacturers and great inventors. American inventive genius always has and I believe always will continue to lead the world. Out of the brain of the Americans came the airplanes of yesterday and out of their brains will come, I believe, hundreds of improvements that will make the airplanes of to-morrow equally radical in their epoch-making possibilities.

We will win this war; why? Because it is a war of democracy against autocracy, a war of mental freedom against mental domination, a war of right against wrong.

Right will conquer. It always has and it always will. Humanly speaking, this war is a mechanical war, a war to be waged and won with machines directed from the air. It is a war that our red-blooded young men, in whose hearts has been kindled the white heat of true patriotism, flying in the blue sky of an ever-increasing democratic world, will, with the help of almighty God, fight to a glorious and victorious end.



An Italian plane, the Pomilio fighter, above
A French plane, the Morane parasol, left



This is the line-up of the cars, drivers and passengers that took part in the second annual Los

California Stages Second Economy Run

Touring Car With Five Passengers Makes
382 Miles on \$2.70 Worth of Gas

LOS ANGELES, Cal., June 24—Just how economical motor car transportation can be made was demonstrated when in the second Los Angeles-Camp Curry, Yosemite Valley, economy run, June 14-15, a touring car with five passengers and luggage made the 382 miles on \$2.70 worth of gasoline. Another touring car carrying but two passengers made the trip for 10 cents less. Of course, these cars were prepared especially for the run but, under the rules of the contest, they had to be stock models and their performance showed conclusively the results that can be obtained by any user under similar circumstances, who will drive with the same care and attention.

Ton-Mileage Basis

The contest was conducted on the ton-mileage basis, so that it did not follow necessarily that the car least economical in the use of gasoline was the winner. The ton-mileage basis is somewhat questionable for passenger car contests, but is the same as that under which the run was made last year and is regarded as near fair for all as would be possible to devise. If there is any handicap, it is in favor of the heavier cars with a reasonable economy in gasoline. Weight is such a dominating factor that a light car must do almost phenomenally in conserving gas to stand a chance to win.

The ton-mileage is determined by multiplying the weight of the car and load by the mileage, reduced to tons and dividing by gallons of gasoline. The Franklin weighed almost 1300 lb. less than the Peerless and although consuming almost 5 less gallons of gasoline and averaging 5 road miles more per gallon came barely within 3 ton-miles of making the same showing.

The sixteen contesting cars were entered by Los Angeles dealers and of the entire number only one fell by the wayside. The Grant failed to make the first night control at Fresno within the time limit and was disqualified. The car was driven by Miss Bertie Priest, who was given permission to drive by the other contestants, although the run was under an A. A. A. sanction which supposedly bars woman participants.

Silver cups were the awards for each class of entries, and in addition Foster Curry presented a sweepstakes cup for the best ton-mileage showing in all classes and the Automobile Club of Southern California awarded the F. L. Baker trophy to the car using the least gasoline, oil and water. The Saxon won in class 1 and the sweepstakes by covering the 382 miles on 13 gal. of gasoline for a ton-mile average of 45.1. The Oakland lost to the Saxon by two-tenths of one point. The showing of the Stephens, which won in class 2 and also the Baker trophy, was the big surprise of the event. The Peerless was the only eight-cylinder car that has competed in two years, and its victory over two six-cylinder cars nationally known for their economy was largely the result of careful driving.

The first day of the run took the cars from Los Angeles to Fresno, a distance of 262.4 miles. The noon stop was at Bakers-

Standing of Cars

CLASS 1—CARS COSTING \$1,200 OR UNDER, FACTORY

Car and driver	Weight	Gal.	Ton	Road
Saxon, S. S. Turner...	3070	13	45.1	29.38
Oakland, F. I. Willey...	3180	13.5	44.9	28.30
Monroe, J. F. Ralston...	3290	16	39.27	23.88
Dort, F. E. Bedford...	3160	15.3	39.25	24.85
Chevrolet, R. Stewart...	2440	13.6	35.67	29.25
Chevrolet, W. B. Felix...	2440	13.6	34.20	28.04
Grant, Bertie Priest...	.....Failed to make first control within limit			

CLASS 2—CARS COSTING \$1,201 TO \$2,000, FACTORY

Car and driver	Weight	Gal.	Ton	Road
Stephens, Fred Johnson...	4070	17.75	43.79	21.52
Lexington, C. C. Shafer...	4060	20.25	38.29	18.86
Stearns-Knight, L. C.				
Buxton.....	4670	24.12	36.97	15.83
Case, G. W. Sundberg...	4210	23.5	34.21	16.25
Moon, G. W. Reilly...	3780	22.5	32.08	16.98

CLASS 3—CARS COSTING \$2,000 AND OVER, FACTORY

Car and driver	Weight	Gal.	Ton	Road
Peerless, S. W. Smith...	4850	23	40.27	16.60
Marmon, Tom Pillow...	5090	25.25	38.5	15.10
Franklin, R. C. Hamlin...	3560	18.12	37.5	21.07
Jordan, R. S. Weaver...	4500	25.5	33.7	14.98
Marmon and Franklin cars were sedan models, Jordan a brougham.				

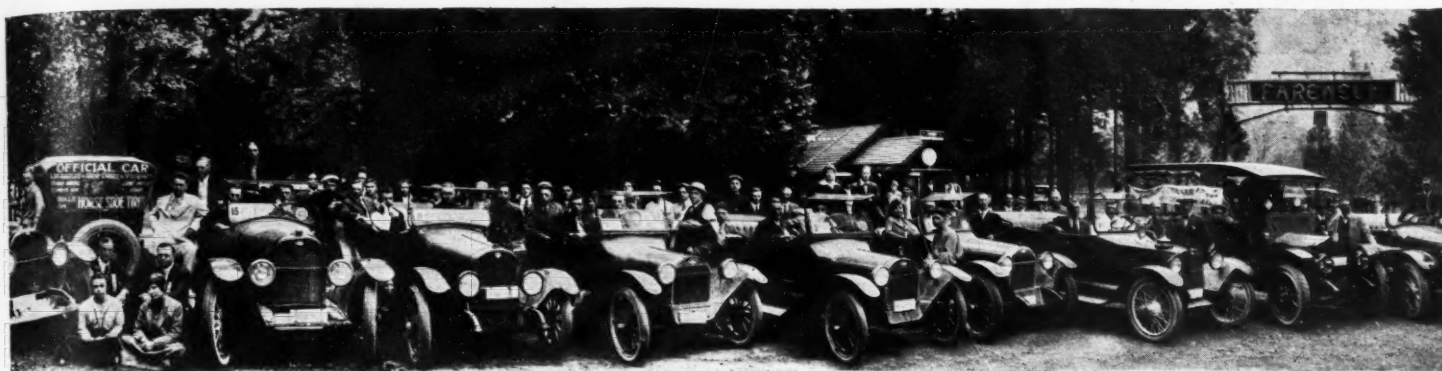
field, 149 miles. From Fresno to Camp Curry was 120 miles. To appreciate what the contestants were up against in their efforts to save gasoline, it must be understood that they covered every kind of road from asphalt boulevard to the corduroy of the logging sections in the mountains. They climbed from almost sea level at the start to an elevation in excess of 7000 ft. and experienced a range in temperature from 68 to 107 deg. Entering the valley, there is a descent of 2000 ft. in 3 miles and here the only near accident of the run occurred. In trying to save gasoline by resorting to the brakes only, the friction on the Lexington became so intense that the car caught on fire. With sand and coats soaked in the nearby stream the flames were extinguished and after tying the transmission up with wire, the car was able to make the last control under its own power.

MAKERS READJUST DISTRIBUTING

Detroit, June 28—In spite of the diminishing production the distribution agencies of most of the passenger car manufacturers are still intact. It is true distributors are not receiving as many cars as they desire nor as many as they need to supply the increasing demand, but they are holding onto their respective lines and making the best of the situation, accepting what supply they can get from the manufacturers. There are many who rather than step out and relinquish their agency have added another line of cars at a different price so it would not conflict with their present line or have taken on the agency for a tractor or truck line. The acquisition of a line of accessories has proved successful for many.

Manufacturers are protecting their distributors as much as they can, endeavoring to equalize distribution all over the country. But where production is so low that an attempt to make an equal distribution would result in a too thin apportionment it is obvious that another course must be taken; some of the distributors must be eliminated. With such action necessary the question of what agencies to drop is an easy one to answer. Some of the manufacturers state we are in a cleaning up period—a weeding out of poor material.

The Packard Motor Car Co. is letting the distributors work out their own salvation, but these dealers are in a different position from the majority; trucks help out the sit-



Angeles-Yosemite economy run June 14-15. This is the end of the run to the park, Camp Curry

uation. Some of the distributors are taking on other lines while a few are dropping their extra lines because they find that some additional lines are not paying the proper proportion of the overhead.

About 10 per cent of the distributors of the Saxon Motor Car Corp. have taken on other lines, but none of them has given up their agencies.

A small number of the distributors for the Oakland have taken on tractors and trucks. The Oakland company has been able to send a satisfactory number of cars into each territory and the distributors are hanging on.

The Willys-Overland, Inc., has been able to maintain a general distribution. Some of the company's distributors have added a truck line. The same condition prevails in the case with Reo and others.

MORE EXPORT LICENSES NEEDED

Washington, June 28—The War Trade Board has modified the export conservation list effective June 28, 1918, as follows:

Individual licenses for the export of fuel have to be secured for marine engines and parts of more than 60 hp.

Individual licenses must be secured for the export of logs including timber round, hewn, sawed, sided or square and for lumber manufactured in all dimensions and sizes for commercial uses including wood suitable for gun stocks, airplane propellers, blades, veneers, for airplane and hydroplane bodies, airplane and hydroplane frames and for Ordnance construction and for wood handles for tools necessary for war supplies.

First German Seaplane Downed by U.S.

Ensign Potter, Accredited with Victory on Teuton Coast, Fell Fighting Seven

WASHINGTON, June 28—Ensign Stephen Potter, U. S. Naval Reserve Force, who was killed in action April 25, is credited with shooting down the first German seaplane destroyed by an American naval aviator.

March 19, 1918, a long-distance reconnaissance of the German coast was made by large American flying boats operating from a British station. Two American naval aviators accompanied this expedition, and one of them, Ensign Potter, was successful in shooting down a German seaplane, which attacked the formation. A second enemy machine was put to rout at the same time. After making a highly successful reconnaissance flight, the seaplanes returned to their base, having sustained but slight damage. The return trip was made in 6 hr. 33 min. actual flying.

April 25 Potter was killed in a fight with seven enemy single-seaters. He was then second pilot to a British Air Force captain, who was with him when he shot down the German plane in March. Two British planes had flown to a point 6 miles from Hinder Light when two enemy planes were sighted heading toward them. The British planes closed upon the nearest German and opened fire at close range. Two more hostile planes then appeared overhead and attacked vigorously. Three others passed astern. The two British planes dived and speeded westward un-

der continuous volleys from the rear. One of the Germans disappeared. Four more enemy machines now appeared in V formation. Of the seven Germans in action, four were attacking Potter and the others his companion. Potter fell behind and began to zigzag. His companion throttled down to enable him to catch up. Potter dodged again, but was then broadside to all the enemy machines and under their fire only 50 ft. from the water. His companion, 250 ft. above, saw Potter's machine burst into flames, come down part of the way under control, then crash on the port wing tip. Potter was last seen on the surface amid flames, which turned suddenly to a high cloud of smoke. Two of the enemy circled over the spot, then joined the other five. When the pall had cleared, not even wreckage was visible.

CADILLAC TO CONTINUE TYPE

Detroit, June 28—The Cadillac Motor Car Co. will continue its present type of chassis and body styles this year. Four years ago the Cadillac company adopted the V-type eight-cylinder engine, and throughout this entire period the characteristics and principles of this construction have been retained. In adhering for another year to its present type and present models, the company is following a policy of long standing.

Ford Contract with Great Britain Has Been Filled

LONDON, July 18—By Cable—The 6000 Fordson tractors ordered by the British government from Henry Ford & Son, Dearborn, Mich., have all been delivered and Henry Ford has now completed all his obligation with the British government so far as the Fordson tractors are concerned.

Now that the government order of Fordson has been completed, this tractor has been placed on retail sale at a purchase price of \$1,250. No information is available as to the quantities in which these tractors will be available for private sales.

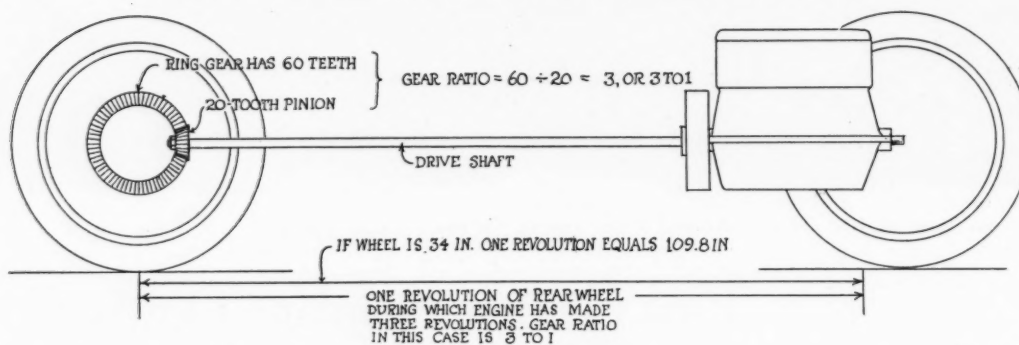
In order to carry out still further its program of

standardization on tractors the government has started the sale of all of its tractors except Fordson, two International Harvester models, namely, Mogul and Titan. This has been done to secure standardized working conditions and simplify to the greatest extent the distribution of spare parts as well as the education of operators for tractors.

In recognition of what Percival Perry, head of the Ford interests in England, has done for the government, he has been knighted and is now Sir Percival Perry. In addition to his tractor activities he is now director of the mechanical warfare department of the government.

The Mathematics of Gear Ratio

How to Determine Other Factors When Given the Gear Ratio and Tire Size



This is a diagram illustrating gear ratio. The small gear is locked to the engine at high gear and revolves at the same speed. The gear ratio is found by dividing the number of teeth on the ring gear by those of the drive pinion

GEAR ratio is the proportion of speed in revolutions per minute between the engine and road wheels. On direct drive this is determined entirely by gears in the rear axle, and the ratio between the engine speed and the wheel speed is the same as that between the number of teeth in the ring gear and pinion. Inasmuch as on high gear the engine is coupled direct to the

pinion shaft it follows that the pinion revolves at engine speed. For instance, if there are twenty teeth on the pinion and sixty on the ring gear, the ratio is 60 divided by 20, or 3 to 1. During one revolution of the rear wheel the engine in this

By B. M. Ikert

Motor Age Editorial Staff

case will make three. If the gear ratio and the tire size are known, it is a simple matter to calculate the car speed.

Suppose we have a car with a gear ratio of 3.5 to 1, 36-in. wheels and an engine developing its full power at 1200 r.p.m. We wish to find the speed of which the car is capable. Each time the wheel turns over, the car travels forward at a distance equal to the circumference of the tire. In case of 36-in. wheels this would be 3.1416 times 36, equal to 130 in., or 9.4 ft. Allowance for slip and compression of the tire makes this about 9 ft. With a 3.5 to 1 gear ratio, the wheel turns over 1/3.5, or .286, times and the car travels 9 ft. times .286, or 2.48 ft. per revolution of the engine. If the engine runs at 1200 r.p.m. the car travels at 1200 times 2.48, equal to 2976 ft. per minute, or 178,560 ft. per hour. Dividing by 5280, we have 33 m.p.h. as the speed of the car.

Any other factors can be determined just as readily. For instance, you can find crankshaft speed for any given car speed if the gear ratio and tire size are known. It is not necessary to make all these calculations, for by referring to the chart any of these problems can be solved direct. To take a specific case, suppose we have given the miles per hour, gear ratio and tire size and we wish to find the revolutions of the crankshaft per minute. Locate the miles per hour on the left margin. Suppose the car is driven at 80 m.p.h. with 34-in. tires and a gear ratio of 1.5 to 1. From the figure 80 move to the intersection of the gear ratio line, designated as 1.5. From here move up to the diagonal of 34 in., then right to the margin where the revolutions of the crankshaft speed per minute are shown, in this case 1200.

To Find Gear Ratio

Given crankshaft speed, tire diameter and m.p.h. to find the gear ratio. Suppose the engine runs at 1000 r.p.m., that 42-in. tires are used and the car travels at 50 m.p.h. From the 1000 mark on the right margin proceed to the left until the intersection of the 42-in. tire size. From here go up to the intersection of the m.p.h. horizontal line. The intersection of this line

GEAR RATIO TABLES

WHEEL DIAMETER	GEAR RATIO	MILES PER HOUR						
		10	20	30	40	50	60	70
30	3-1	336	672	1008	1344	1680	2016	2352
30	3.5-1	392	784	1176	1568	1960	2352	2744
30	4-1	448	896	1344	1792	2240	2798	3136
30	4.5-1	504	1008	1512	2016	2520	3024	3528
30	5-1	560	1120	1680	2240	2800	3330	3920
31	3-1	325	650	975	1300	1625	1950	2275
31	3.5-1	380	760	1140	1520	1900	2280	2660
31	4-1	434	868	1302	1736	2170	2604	3038
31	4.5-1	488	976	1464	1952	2440	2938	3416
31	5-1	542	1084	1646	2168	2710	3252	3794
32	3-1	315	630	935	1260	1575	1890	2205
32	3.5-1	368	736	1104	1472	1840	2208	2576
32	4-1	420	840	1260	1680	2100	2520	2940
32	4.5-1	472	944	1416	1888	2360	2732	3304
32	5-1	525	1050	1575	2100	2625	3145	3675
34	3-1	298	596	894	1192	1490	1786	2086
34	3.5-1	346	692	1038	1384	1730	2076	2422
34	4-1	396	792	1188	1584	1980	2376	2762
34	4.5-1	445	890	1335	1780	2225	2670	3115
34	5-1	494	988	1482	1976	2470	2964	3458
35	3-1	288	576	864	1152	1440	1728	2016
35	3.5-1	336	672	1008	1344	1680	2016	2352
35	4-1	384	768	1152	1536	1920	2304	2688
35	4.5-1	432	864	1296	1728	2160	2592	3024
35	5-1	480	960	1440	1920	2400	2880	3360
36	3-1	280	560	840	1120	1400	1680	1960
36	3.5-1	327	654	981	1308	1635	1962	2289
36	4-1	374	748	1122	1496	1800	2244	2618
36	4.5-1	420	840	1260	1680	2100	2520	2940
36	5-1	468	936	1394	1872	2340	2808	3296

Chart showing engine revolutions at various car speeds with tire sizes from 30 to 36 in. and various gear ratios

also notes the gear ratio line, which is 2.5.

Given the crankshaft speed, tire size and gear ratio, find the miles per hour as follows: go left from crankshaft speed, say 1000 r.p.m., to tire size, for example 28 in. From this point go up or down to intersection of gear ratio line, say 1.5, then left to 55 m.p.h.

Given crankshaft speed, miles per hour and gear ratio tire size can be found by going left from crankshaft speed to intersection of gear ratio line and then up or down to miles per hour, which point will mark intersection of the required tire diameter.

DETROIT RETURN LOADS

Detroit, June 28—The results of the efforts of the Detroit return loads bureau to establish a return loads system in this territory are being made manifest now and the outlook is more hopeful than it was at the start. One route already has been established and steps are now on foot where by several will be in operation before another fortnight passes.

A company styled the Overland Transportation Co. is operating two trucks between Detroit and Adrian, a GMC and a Hall, both 4-ton. They make three runs weekly, leaving Detroit Monday, Wednesday and Friday and Adrian Tuesday, Thursday and Saturday. Most of the produce brought into Detroit is picked up at the small towns along the route. Very little, if any, has come direct from the

farms. The merchandise carried out of Detroit consisted of a great variety of things. About half of the loads were composed of groceries and hardware. The balance was made up of stoves, motor car parts, dry goods, pipe, phonographs, etc. One of the partners of the same company is now arranging to establish a route between Detroit and Jackson.

July 10 it is expected that a route will be started between Detroit and Flint with two 5-ton trucks, one leaving each city daily. It is planned to have the route divided, going north via Pontiac and returning via Fenton, Holly and Milford. Another route is planned from Detroit to Pontiac. It is believed there is enough business along this route for two such lines to operate profitably. Trucks have been in operation along this route on a schedule for some time but independent of the return loads bureau. The tractor train which operates between Detroit and Toledo is arranging to co-operate with the bureau.

BELGIUM PLANS RESTORATION

Chicago, July 1—An organization has been made, with the co-operation of the Belgian state, to help industry and trade of that ravaged country to purchase tools and necessary raw materials that will not only reconstruct the industry and trade of Belgium but help the working classes by enabling them to start work in the reconstructed shops. Everything has to be set up again, and the organization is urging

American concerns to send them their catalogs and prices, in triplicate. The address is Comptoir National Pour la Reprise de L'Activite Economique en Belgique, 15 rue Louis le Grand, Paris, France.

MAY CLOSE CAPITAL M. A. M. A.

New York, July 2—Special telegram—It is altogether likely that the Washington office of the Motor and Accessory Manufacturers' Association will be closed although nothing definite has been decided. The closing of the office will not mean the abandonment of the work which it is carrying on. This is to be continued under the active supervision of A. W. Copland, who is chairman of the association's war service committee and who is in charge of the Washington office. The establishment of the Washington office was with the object of assisting members and the Government in war work. Since the establishment of regional purchasing departments, however, much of the work done by Mr. Copland and his assistants now is being done by the Government; furthermore, many of the M. A. M. A. members who were in line for Government work have received it so that the need for the office rapidly is passing.

President C. W. Stiger is to call a conference of the war service committee of the association for Friday of this week, at which future work of the committee will be discussed and decided upon. This meeting is to be held in Detroit.

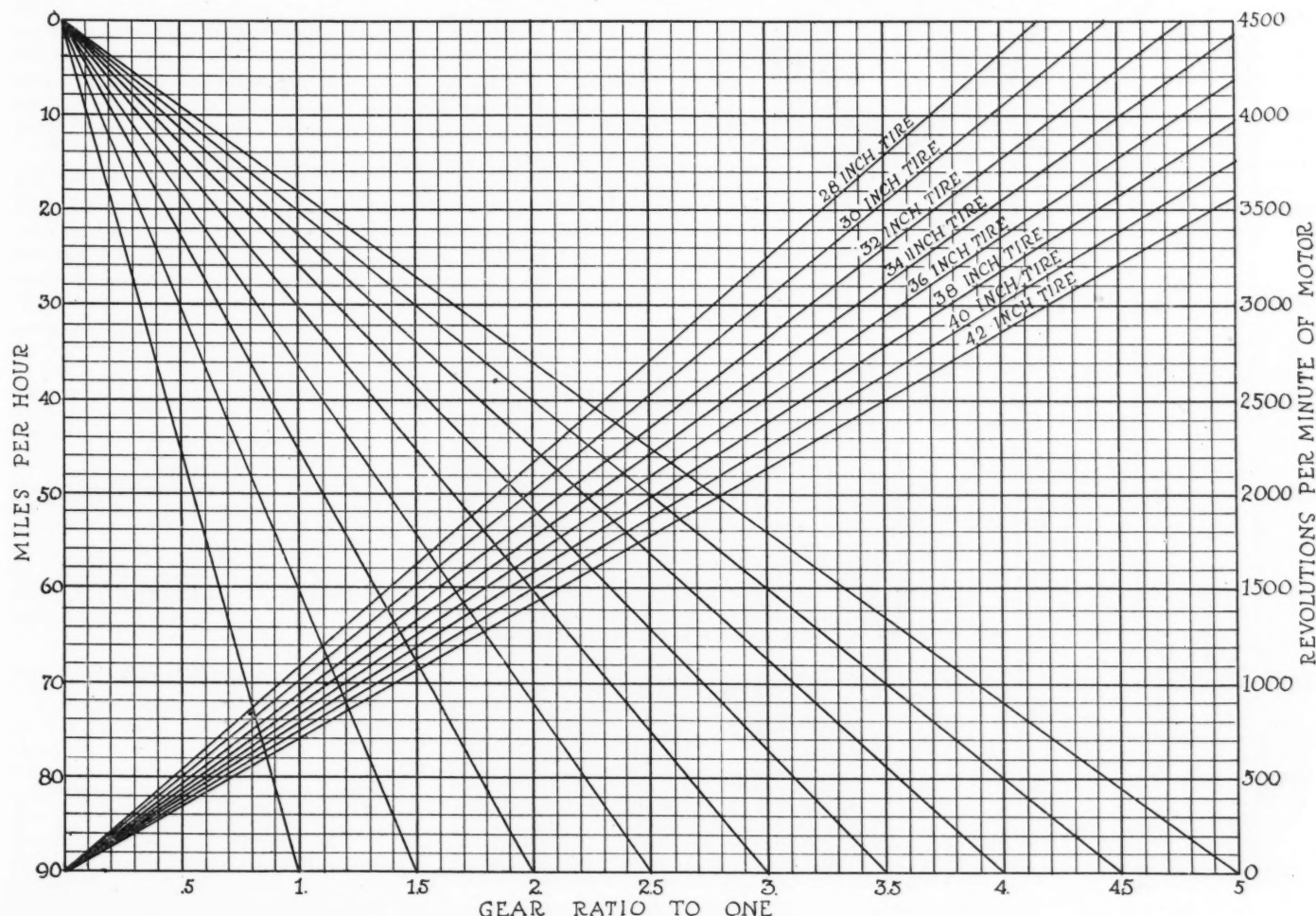
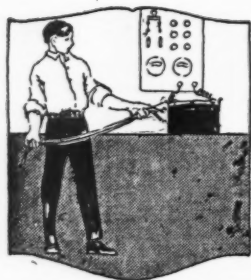
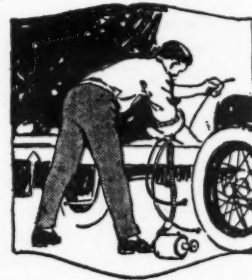


Chart showing how the speed of a motor car may be found if the gear ratio, tire size and r. p. m. of the engine are known



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the 101th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.

A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part CI—Lighting Installation for Fords

THERE are a few installations of simple lighting generators with or without battery but which have no means for cranking the Ford engine. During the last few years, the stock Ford

has been electric lighted from the magneto. Consequently, the number of special lighting installations is small. Three of the more common installations are described briefly here:

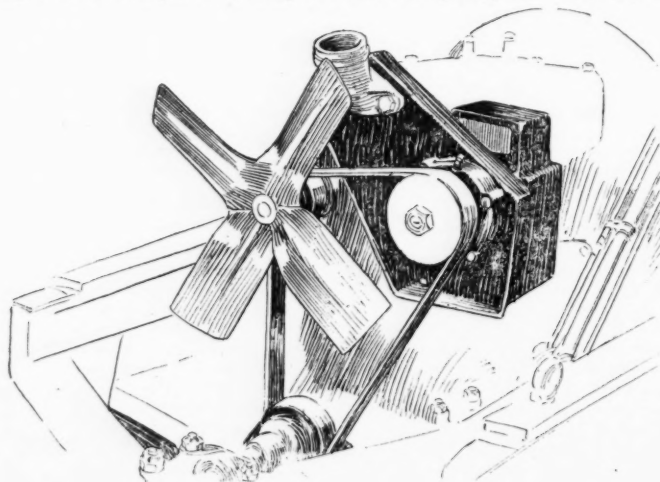


Fig. 560—Installation of Genolite charging generator on a Ford car

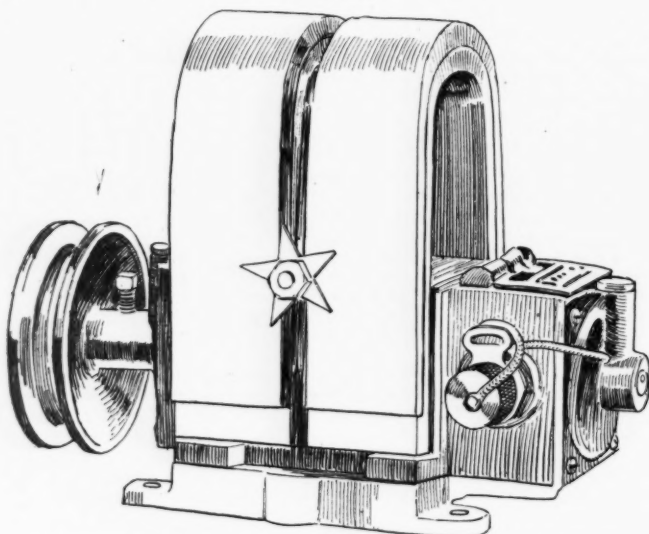


Fig. 561—Hendricks permanent magnet type of charging generator

Genolite System for Fords

The Genolite electrical equipment for the Ford car consists of a charging generator and 6-volt storage battery. The generator is mounted on a special bracket which is attached to the left side of the engine and driven by an extra long fan belt which runs over a flanged pulley on the shaft of the generator as shown in Fig. 560. The storage battery is arranged to be mounted in a steel box on the running board and is held securely in place by strong holddown bolts which are attached to the handles of the battery and pass through the running board with lock washers and nuts on the under side.

The output of the generator and the connection between the generator and the battery are taken care of by a Ward Leonard combination cut-out and controller. The controller is of the constant-current type, that is, it tends to maintain the current output of the generator constant for all car speeds above approxi-

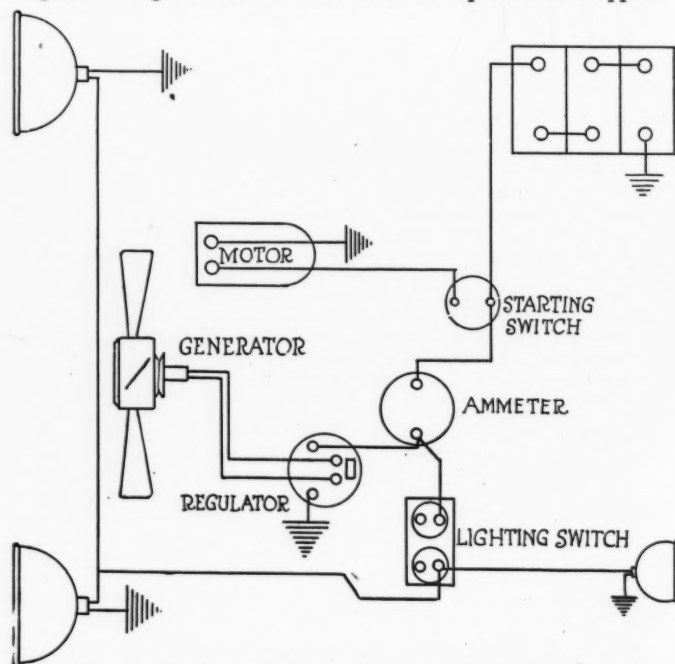


Fig. 562—Wiring diagram of Kemco starting and lighting system for Fords

mately 9 m.p.h. The controller is adjusted for a charging current of 7 amp. The combined cut-out and controller is mounted integral with the generator.

The control switch is mounted on the steering post within easy reach of the driver at all times. It is of the two-gang type and the lights may be turned on full candlepower or they may be dimmed for city driving. The dimming of the headlights is accomplished by using bulbs equipped with two filaments. Two of this type of bulbs are supplied as a part of the Genolite equipment. One of the filaments gives a full candlepower, and the other gives a dim light for meeting anti-glare regulations.

Hendricks System for Fords

The Hendricks lighting generator is of the permanent-magnet type. It is arranged to be mounted on a special bracket attached to the left side of the Ford engine and is driven by a special V-shaped belt which runs over a small pulley on the end of the generator shaft and a larger special pulley which is attached to the fan and driven by the fan belt. The battery is arranged to be mounted on the running board, and the connection between it and the generator is made and broken by an electromagnetic

cut-out. A complete wiring diagram of the system is shown in Fig. 561. All the necessary wires, each cut to the proper length, are supplied with each outfit.

Kemco System for Fords

The latest Kemco system is of the 6-volt, two-unit, single-wire type. The generator and starting motor both are mounted on the same special casting, which takes the place of the timing gear cover.

The generator is of special construction and is driven direct from the crankshaft of the engine by a V-belt, which is claimed not to stretch or slip as an ordinary belt.

The power of the motor is transmitted to the crankshaft of the engine by a strong roller chain and a special set of gears. The roller chain becomes inoperative the instant the engine starts to run under its own power faster than the electrical motor tends to drive it by an overrunning clutch mounted in the large gear on the engine crankshaft.

A wiring diagram of the complete installation is shown in Fig. 562.

Two-Day Demonstration Sells 750 Tractors Minnesota Launches Its Fordson Allotment

MINNEAPOLIS, Minn., June 28—Of the allotment to Minnesota of 1000 Fordson tractors 750 were sold in a two-day demonstration on a 30-acre tract of land belonging to Thomas Frankson, lieutenant-governor. These were cash sales. Hundreds were attracted to the farm in St. Paul to watch the work of the tractors under supervision of W. H. Schmelzel of the Schmelzel Tractor Co. So successful was the exhibition that it has been decided to have a second demonstration near the state fairgrounds through fair week, Sept. 2-7.

Mr. Schmelzel will base the allotment to the farmers of the state on small grain acreage, which makes one Fordson to 8135 acres. The allotment is by counties and the Ford dealers make the distribution without profit. Statistics were compiled for the allotment by A. D. Wilson, federal food administrator for the state. Under this acreage arrangement Polk county, for instance, is to get an allotment of forty-one tractors, and Ramsey county, in which St. Paul is situated, will get one, and Hennepin county, with the other twin city, five Fordsons.

Miss Elsa Feist of McCarron Lake, sister of one of the Ford employes in the Schmelzel plant at St. Paul, with no previous experience in operating motor engines, plowed for the two days with a Fordson and made such a hit that she was retained to demonstrate the tractor and Oliver plows at Grand Forks, N. D., and Moorhead, Minn.

TRUCK SERVICE FOR OKLAHOMA

Muskogee, Okla., June 28—To relieve the very serious freight congestion which Oklahoma is suffering, a group of business men of the state recently incorporated at \$200,000 the Service Transportation Co., which will operate at least fifty motor trucks to all parts of the state and to Arkansas. The rates, it is expected, will be approximately the same as local freight rates. Terminal stations will be built in all the cities through which the trucks will

run and small stations in the towns. These trucks will run out of Muskogee to Tulsa, Richardsville, McAlester, Vinita, Okmulgee and other of equal size. They will also run to Fort Smith and Siloam Springs, Ark.

NEBRASKA PROMOTES TRUCK LINES

Omaha, Neb., June 28—Vast increase in the use of motor trucks for short freight hauls and the establishment of return load bureaus in Omaha and Council Bluffs promise to be early developments of the increase in railroad freight rates ordered by Director-General William G. McAdoo.

Already truck lines for bringing to market every kind of farm produce are running into Omaha and Council Bluffs from every direction within a radius of at least

50 miles. Thus far this season over 75,000 head of hogs have been brought to the South Omaha livestock market in this manner, and the first to be brought in this way was hauled to market last fall. A single day's deliveries of hogs brought in by truck amounted to 1306 head. Young cattle are also being brought in largely in this way, while merchandise for stores in towns near here already is being hauled in considerable quantities on the return trips, but this feature has not been systematized or extensively developed as yet.

Road conditions, particularly in Nebraska, are the chief stumbling block in the way of the movement, and the commercial bodies will give this feature special attention before proceeding, with the object of stimulating road work of a permanent nature.



Miss Elsa Feist demonstrating the Fordson on the farm of Lieutenant-Governor Thomas Frankson of Minnesota

The Motor Car Repair Shop

Testing Bearings for Parallelism

AFTER connecting rods and pistons have been rebushed it is essential that bearings be tested for parallelism. The bearings in the big ends of the connecting rods must be parallel to the piston pin bearing or the piston will not travel at right angles to the crankshaft. This may cause scoring of the cylinders, rapid deterioration of the bearing itself and, in general, cause the engine to run inefficiently. A piston slap is often traceable to bearings that have been improperly lined up. Damage sometimes is caused also when the piston pin is taken out and so far as possible the pin should be removed with proper apparatus, instead of hammering it out with the piston improperly supported. To make a simple jig for this proceed as follows:

Refer to Fig. 1. Six pieces of steel 1 in. wide, $\frac{1}{8}$ in. thick and 6 in. long are used. Bend four of these at the bottom, at right angles, so it can be fastened to the bench. The other two pieces are riveted, as shown at B, to a cross bar about 5 in. long, 1 in. wide and 1 in. thick. The middle bar is drilled and tapped to take a bolt of any convenient size. The six pieces of steel are drilled also with several holes, say five, through which a pin is inserted, as shown in the upper illustration of Fig. 1. This makes it possible to use the jig for different sizes of pistons. A block of wood curved in one side, as shown at B, is placed between the uprights and the piston with the pin in place is made to take the position shown. By turning down on the bolt the pin is forced out through the hole in the block of wood and through a hole in the bench. The same device can be used to force out bushings in the piston.

Testing for Parallelism

In Fig. 2 is shown a convenient method for determining whether the bearings in the upper and lower end of a rod are parallel. A mandrel of the same diameter as the crankshaft bearing on which the rod is to go is clamped in the vise and the rod bolted to it, setting the nuts up tight, the same as when in service. A second mandrel is placed in the piston pin end and should be a snug fit. A gage now is made by cutting off a piece of brass tubing, the diameter of which is smaller than the large mandrel. The short piece of tubing is cut lengthwise, making the sides perfectly parallel. This can be ascertained by placing on a surface plate and scribing the top with a surface gage. Now drill a hole in the center of the piece to take an ordinary spoke nipple. This is soldered to the brass. Put the threaded end of the spoke in the gage and cut off the spoke to come almost to the bottom line of the top mandrel. Place the brass piece on the bottom mandrel; the semi-circular shape of it will cause the bottom edges to assume a parallel position with the mandrel. The spoke should be screwed up so it just touches the bottom of the upper mandrel, at the same time swinging the gage slightly

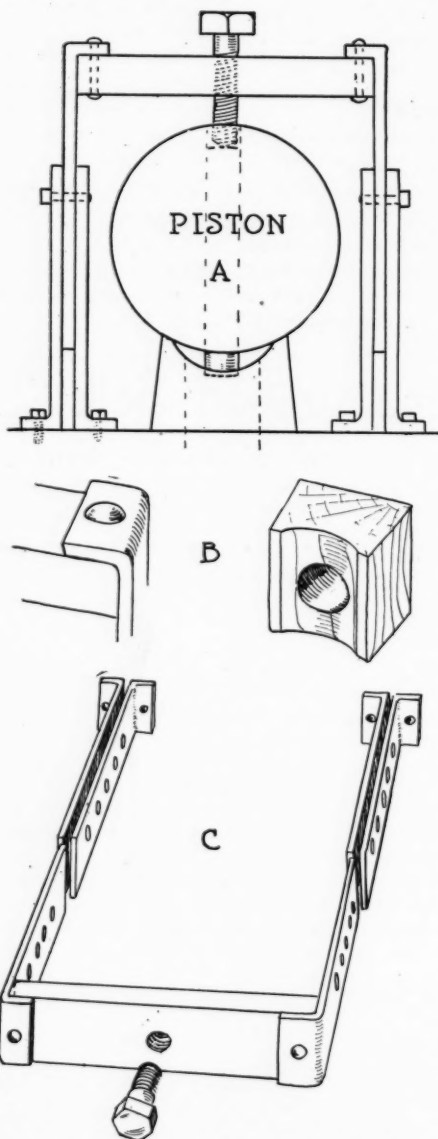


Fig. 1—A device for removing piston pin, to prevent damage to piston and bearings. It is adjustable for different sizes. The upper illustration shows the piston in position and the bolt forcing the pin through the hole in the block of wood

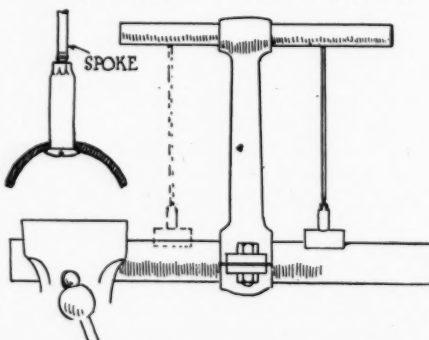


Fig. 2—Testing rod bearings with gage made of spoke and short piece of brass tubing

about the mandrel. With the same setting of the spoke place the gage on the other side and note if the distance is the same. If the top of the spoke binds considerably or cannot be made to clear it shows the bearings not parallel.

Before making the test, be sure the mandrels are absolutely accurate. It is important, too, that there be no metal shavings or other particles on the connecting rod shims, as this would cause one side to be thrown out when the rod is clamped in position.

Jig for the Shop

Fig. 3 shows a more elaborate jig intended for shops doing considerable bearing work on one particular size. The jig is not adjustable for different sizes, but can be made so by using different mandrels at the bottom. The base should be of cast iron, properly seasoned. It should be made substantial enough to prevent possibility of the parts becoming out of line. The important dimension is A, Fig. 3, which should be the same as the distance between the centers of crankshaft and piston pin bearings of the rod. When the casting is ready for machinery it should be handled carefully for if carelessly made the results will be inaccurate. The shaft, or mandrel, at the bottom must be at right angles to the plate B. A collar is placed on the shaft to act as a shoulder for the rod to bear against. The disk or plate B is mounted on a stub shaft and fastened to the casting, as shown. A second plate is made and furnished with a shaft of the same diameter as the piston pin. In fact, a piston pin can be used for the shaft.

To test a rod it is clamped around the lower shaft and the loose disk inserted in the upper end. If the rod is now swung into an upright position the bearings can be tested for parallelism by comparing the disks. The device could be elaborated on by having another disk on each side of the bed plate, so the rod could be swung into a horizontal position and lined up with these disks. This would necessitate a larger base. When a rod is found to be true, the piston will run true in the cylinder.

A method of testing bearing parallelism is shown in Fig. 4. Here the piston is attached to connecting rod and the wrist pin bearing clamped to a mandrel held in a vise. A square is placed against the mandrel and side of the piston, and in this manner the alignment checked up. The same method can be used when the pistons are in position in the engine, with the block removed. The top of the crankcase is planed true and the lower edge of the square can be placed against this and thus the piston checked up to see whether it is square with this surface.

A fourth testing method is that shown in Fig. 5. This consists of a surface plate A on which has been mounted two pillow blocks B, to take a mandrel C of the same diameter as the wrist pin of the crank-

shaft. In setting up this jig care must be exercised to get the mandrel perfectly horizontal or parallel to the top of the surface plate. The connecting rod with piston attached is clamped to the mandrel and held in an upright position. Place a steel straight edge D on top of the piston and with a height gage test the top of the straight edge at each end. If one end is lower than another it shows that either the wrist pin bearing is not true or the piston is set at an angle to the connecting rod. Such a piston would quickly score a cylinder in many cases. This method also can be used when the pistons are in place on the engine by placing the height gage on top of the crankcase and scribing in the same way.

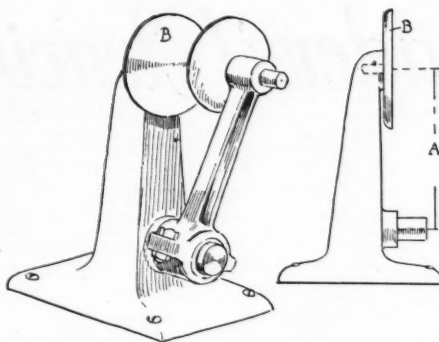


Fig. 3—How jig might be made for shop doing much bearing work. The distance A is from center of wrist pin to center of piston pin

AUTOMOTIVE ELECTRIC MEETING

New York, June 29—The Automotive Electric Association will hold its semi-annual meeting at Lake Placid, N. Y., July 10-13. Among the papers which will be presented is one on "Size and Performance of Batteries in Relation to the Size of Engines or Work to Be Done" by C. F. Gilchrist, chief engineer of the Electric Auto-Lite Corp. A. D. T. Libby, consulting engineer of the Splitdorf Electrical Co., also is on the program.

MONEY FOR AVIATION STATIONS

Washington, June 28—The Fortification Bill, carrying \$5,435,096,224 appropriation, includes aviation and balloon stations, permanent, \$10,500,000; aviation stations for insular possessions, permanent, \$4,420,000; aviation stations for the Panama Canal, permanent, \$5,886,000. This bill was reported Monday by the House Committee on Appropriations.

LIEUT.-COL. W. G. WALL NOW

Washington, July 2—Special telegram—Major W. G. Wall of the Ordnance Department is now a lieutenant-colonel. He has just returned from the American Expeditionary Forces in France, where he was studying the experiences of our Army with motor equipment, including military tractors and tanks.

Colonel Wall formerly was chief engineer of the National Motor Car & Vehicle Corp.

AIR POSTAGE IS REDUCED

Washington, June 29—Beginning July 15, the postage rate for airplane mail between New York and this city, now 24 cents per ounce, will be reduced to 16 cents for the first ounce and 6 cents for each additional ounce. This is a 6-cent rate plus the usual 10 cents for special delivery. The reduction is expected to greatly increase the use of the air mail service.

DELAYS IN TRANSPORTATION

Chicago, July 2—Transportation delays are having a much more serious effect upon present tractor production than is shortage of materials, despite persistent rumors that it is difficulty in securing materials which is cutting tractor production schedules below estimates of what would be done this year. This fact was brought out in the course of an investigation of present

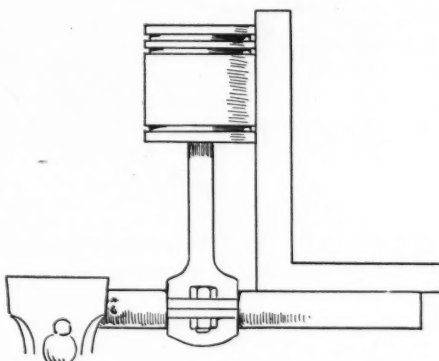


Fig. 4—Testing piston alignment with straight edge placed on mandrel held in vise

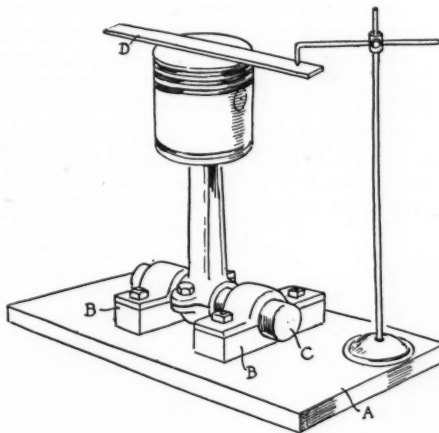


Fig. 5—Top of piston can be scribed with height gage supported on surface plate. Each end of straight edge must be checked

tractor production conditions concluded within the last few days.

For the most part tractor manufacturers anticipated a possible shortage of materials and most of them took precautionary measures far enough in advance to insure an adequate supply for all manufacturing needs up to date. Some shortage is expected for the future, but up to the present time, generally speaking, the situation has not been serious.

Those companies which admit trouble due to lack of material for the most part are those which assemble their tractors in part, and say their production has been delayed because they could not get wheels, engines, steel castings, differential gears, brass parts and the like. Companies build-

ing their own engines have experienced very little trouble.

Companies reporting on the situation practically all admit that production at present is below expectations, and is very decidedly below the demand, but none takes an especially gloomy view of the future.

REDDEN ADDS TO LINE

Chicago, July 1—The Redden Motor Truck Co. has enlarged its line by the addition of two new products, one a universal truck maker, which has been designed to fit any make or model of passenger car, regardless of the kind or location of the transmission mechanism, and a four-wheeled trailer.

LA CROSSE TO MAKE IMPLEMENTS

Chicago, July 2—The La Crosse Tractor Co., La Crosse, Wis., will be on the market soon with a line of tractor-operative equipment, which will be marketed under the name of the Happy Farmer. Included will be the Happy Farmer tractor disk harrow, the Happy Farmer power tractor grain drill and the Happy Farmer gang plow. These new implements are so constructed that they all can be operated from the seat of the tractor. Furthermore, the line will be painted in distinctive orange color to correspond with the Happy Farmer tractor.

It is understood that this line of power-operative equipment will be manufactured by the La Crosse Plow Co., La Crosse, Wis., and sold exclusively with the Happy Farmer tractor.

SALE OF PAIGE DENIED

Detroit, July 1—The rumor that the General Motors is about to purchase the Paige-Detroit Motor Car Co. is unfounded, according to H. M. Jewitt, president of the Paige company. The Paige company has been approached several times in the past by the General Motors Co. with offers and the recent visit to the east of Mr. Jewitt, who sought an interview with W. C. Durant of General Motors, caused an over-zealous newspaper correspondent to write a story to the effect that Mr. Jewitt's visit was prompted by a desire to go through with the deal. As a matter of fact, the conference between the two men dealt only with the steel situation.

N. A. D. A. RECRUITS MEMBERS

New York, July 2—Special telegram—At a meeting of the dealers of New York and territory within 75 miles yesterday more than 100 dealers joined the National Automobile Dealers' Association. President F. W. A. Vesper of the N. A. D. A., told the story of what the association has done and is doing to safeguard dealers and the meeting unanimously enrolled when requested by Executive Secretary E. E. Peake. Mr. Peake and Mr. Vesper left this morning for Philadelphia, where a similar meeting will be held this noon. Pittsburgh joined with 208 Thursday night and Harrisburg with 40 Friday night. Big meetings are scheduled for Cleveland, July 9; Indianapolis, July 10, and Minneapolis, July 12.

The Readers' Clearing House

Carburetion

Overheating Carburetor Mixture

Q.—Would it be possible to overheat the mixture before it is taken into the engine? If so, how could I tell what the result would be? Would high-test gasoline work well in an engine equipped with a hot-spot manifold such as most new cars have?—H. W. Brown, Triplett, Mo.

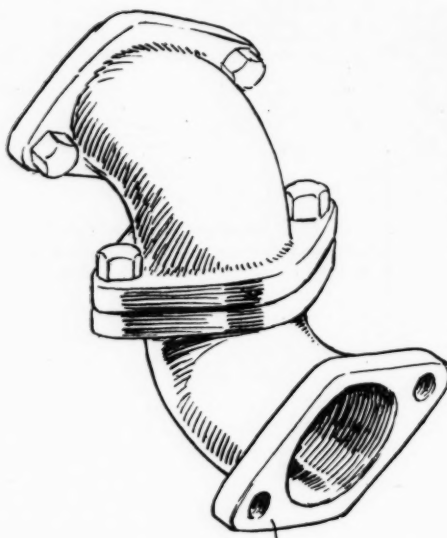
It is possible to overheat the mixture taken into the cylinders, and by doing this the volumetric efficiency is reduced. You can tell this by loss of power in the engine; the pickup will be sluggish and when you open the throttle, there is not the snappy increase in speed resulting when a carburetor is correctly set and the air and mixture heated to the right temperature. In the hot months of the year better results sometimes are obtained if the hot-air pipe to the carburetor air intake is removed.

High-test gasoline should give satisfaction in engines equipped with hot spots.

Attaching Carburetor to Crow-Elkhart

Q.—I have a Crow-Elkhart motor car, 1917 model, and have a Rayfield carburetor, L. 2 E, but cannot fit the carburetor to the regular manifold on account of the oil pump. Where can I get a manifold for it?—R. C. Goodrich, Hemp-hill, Tex.

As long as the oil pump is in the way it seems the only remedy would be to fit a manifold to slightly offset the carburetor. We do not know where you can get a manifold that would do the work, but it seems likely that by combining two manifolds you might be able to accomplish it, as suggested in Fig. 1 in answer to L. Grant. The flanges on such manifolds are standard size and by looking at different makes of cars using the same size carburetor, you ought to be able to pick out one that either would suffice alone or in com-



ATTACH CARBURETOR TO THIS FLANGE

Fig. 1—Attaching Sunderman carburetor to 1915 Saxon four by bolting on another inlet manifold

bination with another. Another suggestion would be to weld on a piece of tubing to the present manifold and then weld on a flange to this, attaching the carburetor to it.

Carburetor Back-Spit Causes

Q.—What causes a Ford to make a back-spitting through the carburetor when mixture is rightly proportioned and valves are all tight?—George W. Baadte, Andover, S. D.

This might be caused by a cold engine, but if the trouble continues after the engine is warm it shows one or more intake valves not seating, or the mixture is too

weak. The trouble, if valves, may be simply a sticking intake valve, which at other times may be seating all right. The remedy is to clean out the valve guides and put a little graphite on the stems and guides. Sometimes spitting in the carburetor takes place when the engine is started, because the latter is cold and the charge burns so slowly that it ignites some of the incoming gas and consequently spits back in the carburetor.

Attaching Sunderman Carburetor

Q.—Advise the method of attaching the model F Sunderman vacuum carburetor to a 1915 Saxon four roadster.—L. Grant, Albuquerque, N. M.

In Fig. 1 is shown a method for attaching the Sunderman carburetor to the Saxon four. The Sunderman carburetor is made with a side outlet, but by putting on a second intake manifold, or elbow, as shown, bolting the two together and then fastening the carburetor flange to the flange of the second manifold, the installation can be made. This may cause a little more difficulty in starting, as it brings the carburetor somewhat farther from the cylinder block, but if compression is good, valves seating and timed properly and ignition correct, you should have little trouble.

Miscellaneous

Here is an Old-Timer

Walker, Iowa, Editor *MOTOR AGE*—It is just twenty years ago to-day that I drove the car shown in the photo to the Omaha exposition. I thought perhaps your readers would be interested in looking at a picture of what was then considered quite a good-looking car. Its lines are in direct contrast to the present streamline bodies. —A. G. Gary.

Wants Special Body

Q.—I have a 1910 Cadillac four-passenger that I want to make into a neat roadster. Where can I have a good substantial body made? I took up the matter with one body concern, but they are too high priced.—Fred Schuman, Manchester, Iowa.

About the only thing we can advise you to do is to take the matter up with builders of special bodies, such as advertised in *MOTOR AGE*. Bear in mind these are war times and material, labor, etc., have advanced considerably and besides, special jobs like this naturally are high priced, as the builder must often make special apparatus to fit the case.

Oil Gets Past Rings

Q.—I have a 1918 Saxon roadster which has been run 1400 miles. I am troubled with oil working by the pistons. If I carry as much oil in crankcase as directions call for, there is a blue smoke coming out of the exhaust. It has been necessary for me to clean the engine three times in the 1400 miles that I have made. What could I do to overcome this trouble?—C. F. Patry, Bengal, Minn.

If you are carrying the correct amount of oil in the crankcase, and everything else seems to be in good shape, it appears that the pistons rings must be a sloppy fit in the cylinders. This would hardly be the



Fig. 2—Twenty years ago the owner of this car drove it from Walker, Iowa, to the Omaha, Neb., exposition

case in 1400 miles of travel, provided the rings were in good shape when installed. You might try cutting down the oil a little at a time and note the results. In some cases makers have specified a little higher oil level in the crankcase to play safe, and very often owners can cut down on this with the engine operating just as good, or in many cases better.

Also make sure your ignition is correct. A faulty spark does not burn the mixture as it should and much of the mixture and oil is left unburned. Be sure also that you are running as lean as possible, with plenty of hot air going to the carburetor.

Wants Body and Timing Gears

Q.—Where can I buy a streamline body for a Ford and spiral cam gear?—George W. Baadte, Andover, S. D.

Refer to the advertising section of MOTOR AGE. You will find listed there makers of such bodies, also makers of helical timing gears. You will need two of these gears, the large cam gear and the smaller one that goes on the crankshaft.

Stolen Cars in Large Cities

Q.—Why is it that so many motor cars are stolen in some of the larger cities, when most of the cars are equipped with keys for locking same? Are these keys of no effect in preventing the engine being started? If so, what would be the proper safeguard to adopt?—G. H. Ribbing, Hiteman, Iowa.

You must bear in mind that for every car stolen there are thousands that are not stolen. Also, records seem to show that the cars equipped with some good locking device are generally not stolen. Of course, it is possible with some locks to wire around them and thus get the engine going, but a car equipped with a lock that shuts off ignition, gasoline and gears is pretty safe in the larger cities. In some cases owners get careless and forget to use the key in the locks, leaving the car unprotected.

Wheelbase and Racing Speed

Q.—In the issue of May 30, page 32, you state the wheelbase of the Elcar is 160 in. Is this a mistake, or is it really that long?

2.—Can a racing car be made in such a way as to go about 150 m.p.h. by making every part a little larger, including carburetor and magneto?

3.—Where can I obtain some motor car books on repairing and driving?—P. Asquini, Chicago.

1.—This was a typographical error. The wheelbase is 116 in.

2.—You would not be able to get a car to do 150 m.p.h. simply by enlarging the parts. In fact, in the last few years the higher speeds obtained have been made not with larger engines or cars but with smaller and better designed jobs. The great difficulty in getting more speed is that the slippage becomes greater as the speed is increased.

3.—There are several good books relating to the maintenance and driving of cars, such as "The Modern Gasoline Automobile" by Victor Page and "Dyke's Automobile Encyclopedia." The former is published by the Norman W. Henly Co., New York, and the latter by A. L. Dyke, St. Louis, Mo.

Radiator Is Clogged

Q.—I have a radiator which is scaled up so that no water will run through it any more. What can I do to remedy it, or would it be more convenient to send it to a radiator repair shop?—W. W. Siemens, Mountain Lake, Minn.

Try cleaning out the deposits with a strong soda solution put in hot and let the

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has segregated inquiries into classes of allied nature. Questions pertaining to engines will be answered under that head, and so on.

CARBURETION

H. W. Brown.....Triplett, Mo.
R. C. Goodrich.....Hemphill, Tex.
George W. Baadte.....Andover, S. D.
L. Grant.....Albuquerque, N. M.

MISCELLANEOUS

A. G. Gary.....Walker, Iowa
Fred Schuman.....Manchester, Iowa
C. F. Patry.....Bengal, Minn.
George W. Baadte.....Andover, S. D.
G. H. Ribbing.....Hiteman, Iowa
P. Asquini.....Chicago
W. W. Siemens.....Mountain Lake, Minn.
Louis Le Cocq.....San Francisco, Cal.
Fukimoto Auto Co.....Seattle, Wash.
Reader.....Brooklyn, N. Y.
L. Grant.....Albuquerque, N. M.
J. I. Elliott.....Chicago
G. B. Dickie.....Calgary, Canada
Rafael Olsen.....San Antonio, Tex.
E. K. Harris.....O'Fallon, Mo.

ENGINES

J. White, Jr.....Lexington, Ala.
J. C. Gardner.....Accutneyville, Vt.
E. C. Curfman.....Maryville, Mo.

THE ELECTRIC SYSTEM

J. E. Harris.....La Harpe, Ill.
Oland Heskett.....Hillview, Ill.
E. A. McCune.....Carnegie, Pa.

No communication without the writer's name and address will be answered in these columns.

engine run for several minutes to give the solution a chance to circulate. Then drain and repeat, if necessary. If this does not prove effective, try an acid solution made by adding hydrochloric acid to water. This should be allowed to circulate for a few minutes, after which the hot soda solution should be poured in, draining out the acid, of course. Then let the engine run a few minutes with the soda solution, after which refill with clear water. If the radiator is clogged very badly you had better send it to a radiator man. The chances are the core is clogged so badly that a new one will be necessary, as the deposits get so hard that nothing will remove them.

Has Joined the Colors

San Francisco, Editor MOTOR AGE—I am sending a photograph to you of the Roamer racing car which I formerly drove in races on the coast. I have quit the motor racing game and enlisted in the Naval Reserve Flying Corps and expect to be in service

within a few days. I have been mechanic for Mulford, Oldfield and Hearne on several occasions and drove a Roamer racing car at Ascot Park at Los Angeles, March 17. In this race I turned over three times only to put the car back on wheels and drive to the pit under power.

Now I am ready for the air service. I deem this a patriotic duty and hope to see the other drivers do the same. I was much impressed when Eddie Rickenbacker forsook the game to join Uncle Sam's flying force.—Louis Le Cocq.

No Record of This Car

Q.—Publish a side view sketch of Durant's Chevrolet Special.—Fujimoto Auto Co., Seattle, Wash.

We have no record of this car and wonder if you have applied the wrong name.

Wants Axle Layout

Q.—Give sectional view of the universal joints and layout of front axle on the Homer-Laughlin front-drive car.—Reader, Brooklyn, N. Y.

This concern is not making cars for the duration of the war and we are, therefore, unable to obtain these views.

Spring Starters for Saxon

Q.—Publish names and addresses of concerns making spring starters for Saxon four roadster.—L. Grant, Albuquerque, N. M.

We have no record of any concern making spring starters for the Saxon four. There are numerous concerns making them for Fords and it may be that by writing to these you will find one that can be applied to your car. You will find such concerns in the advertising section of MOTOR AGE.

Adjusting Chevrolet Steering Gear

Q.—How is the steering gear adjusted on the Chevrolet 490, 1918 model? This is, I believe, a worm gear. How and what kind of oil should be used? Give sketch.—G. B. Dickie, Calgary, Alberta, Canada.

The adjustment of the Chevrolet steering gear is very simple. We have no illustration of this gear, but that shown in Fig. 6, used on one of the former Overland models, is much the same as that used on the Chevrolet. The adjustment is similar also. To take up the play proceed as follows:

At the top of the steering gear housing will be found a collar that has notches cut in it. Loosen the bolt just under the collar and turn the collar in a clockwise di-

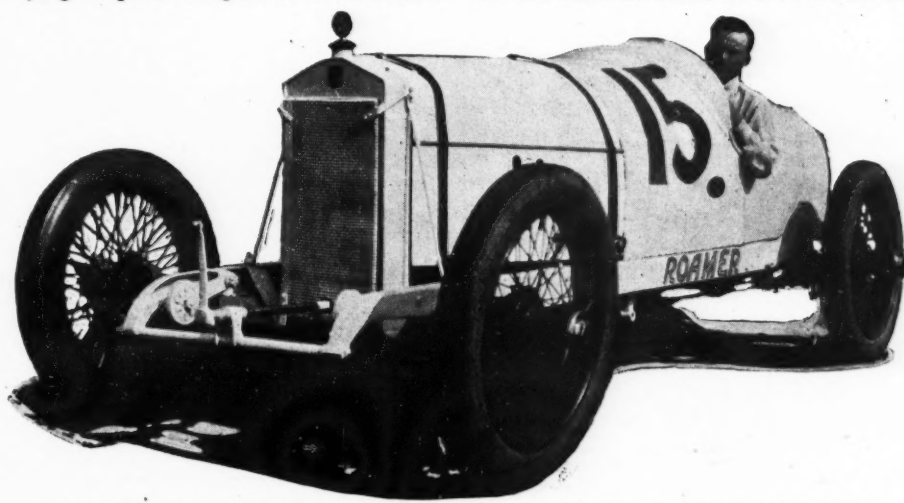


Fig. 3—Roamer racing car driven by Le Cocq, who has forsaken the game for Uncle Sam's Naval Reserve Flying Corps

rection. Be careful not to draw it up too tightly, for there is danger of damaging the gearings. Try the adjustment in several positions. There is also an adjustment in each end of the drag link which connects the left steering knuckle arm with the steering gear crank arm. These adjustments can be taken up by removing the cotter pins and turning up the nuts on the ends of the link. Turning up these nuts forces the springs against the cups that fit against the ball ends of the knuckle arm and steering gear crank. Do not turn the plug up too far. The adjustment is sufficient when no rattle or lost motion can be detected by attempting to move the drag link backward and forward by hand. The gear housing should be packed with a light cup grease.

Removing Road Tar

Q.—What will remove the tar and road oil from car without damage to varnish?—J. I. Elliott, Chicago.

Tar is one of the worst enemies of a fine finish and should be taken off as soon as possible. Road tar that has not been allowed to dry can be removed by a local application of a mixture of butter or lard, with a small quantity of salt. Take a small amount of it on the finger and rub it on the tar spot so there will be no scratching. This should loosen the tar and allow it to be washed off. No detrimental effect will be noticed if the tar is taken off before it becomes hard, but if allowed to dry it gradually will get in its destructive work of eating through the varnish to the wood or metal.

1912 Winton Cranking System

Q.—I have a 1912 Winton six and would like to have the compressed gas starting system on it explained. Publish drawings showing how to install it and how it works.—Rafael Olsen, San Antonio, Tex.

Fig. 4 shows the principal parts making up the Winton self-cranking system used on the 1912 car. This is not a priming device. Air pressure admitted to the cylinders causes the pistons to move through their various strokes. During this movement, which draws in fresh gas, the spark occurs, igniting the gas and causing the engine to begin its regular operations. Thus the pistons already are moving when the spark occurs in the same manner as with the modern starting motors. At-

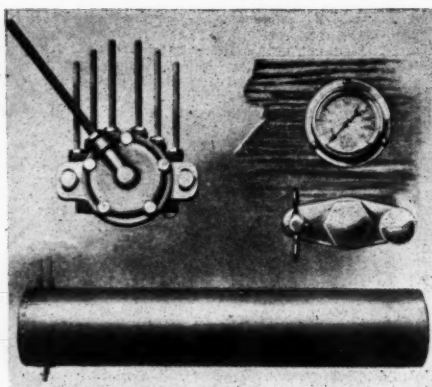


Fig. 4—Self-cranking distributor, dash assemblage and air tank used on 1912 Winton



WHAT do you do with your copies of MOTOR AGE when you are through reading them? Perhaps you file them for future reference, or cut out certain articles that pertain particularly to the maintenance of your car. Above is shown what becomes of MOTOR AGE after E. K. Harris, O'Fallon, Mo., gets through reading it. He simply puts it out on the mail box and it is picked up by the rural mail carrier, who after scanning the pages passes it on to some other enthusiast

tached to cylinders 3 and 4 are outlets through which a small portion of the pressure of each power stroke passes to a copper pressure tank, carried between the left frame rail and the driving shaft. Here the pressure is stored until required to start the engine.

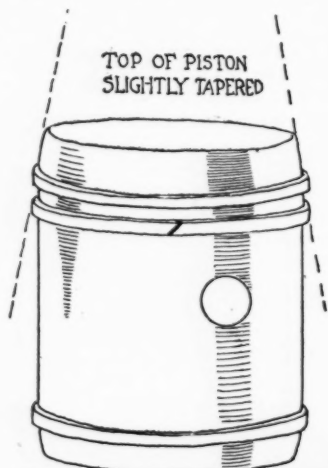
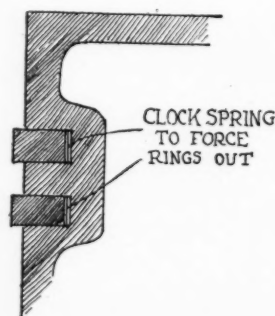


Fig. 5—How top of pistons can be turned conical to prevent excessive piston slap. Right, clock springs under rings to force them against cylinder walls



By pressing a push button on the dash, pressure is allowed to flow through the distributor to one of the cylinders. The pressure forces the pistons to move and as a piston passes the firing point the engine starts. However, if for any reason the first cylinder should fail to fire, the distributor sends the pressure to the cylinder next in order and forces the next piston past the firing point and so on, if necessary, through the series of cylinders. The system has but one moving part, the distributor valve. This valve is lubricated from the dash.

Assembled on the dash are the gage, which shows the amount of pressure stored in the tank; the push button, which allows pressure to flow from the tank to the cylinders; and a shut-off valve, for use when the car is to remain long idle, preventing escape of pressure from the storage tank.

Engines

Engine Point Suspension

Q.—I have a 1917 Ford that has a rattling knock, seemingly in the front of the engine, most noticeable when idling with spark advanced.

2—Will a car with four-point suspension stand the twist and strain with a three-point suspension?

3—What is the horsepower of a Briscoe?—J. White, Jr., Lexington, Ala.

1—It is possible that the knock coming from the front end of your engine is caused by the timing gears. Sometimes these gears have what is called a high spot, that is, the cam or crankshaft gear may run a trifle eccentricly, thus causing the gears to mesh a little deeper at one point. This sets up a grating noise, emphasized when the engine is speeded up. It is not very likely that the noise is caused by the pistons, although it may be that you have what is called a piston slap in one of the front cylinders. This is caused generally by lack of lubrication, but it seems that in a comparatively new car this would not be the case. Also check up on the valve clearance. If one of the valves has too much clearance, there will be a decided tapping noise when the engine is run fast.

2—Yes. There are several cars on which the engine is mounted on four points giving satisfaction. But the three-point suspension is considered by many superior to the four-point. You can see the advantage of this by placing a stool with four legs on an uneven surface and then one with three legs. The former will have one leg not resting on the surface, whereas with the three-legged stool, try as you will, it will always rest on the three.

3—The rated horsepower of this car is 24 hp.

Grinding One Cylinder

Q.—Explain the best way to grind in oversize pistons where only one new one is to be put in. I have a re boring jig but do not want to use that.—J. C. Gardner, Ascutneyville, Vt.

We believe that you can get around re boring one cylinder by the method suggested herewith, unless the cylinder walls are badly scored or out of round.

One way would be to remove the piston and put it in a lathe and see that it revolves absolutely true. Now take a light cut and turn down the space or ridges between the ring grooves. The cut should not be much over 0.008 in. at the head of the piston and should gradually taper to

nothing at the lower edge of the groove above the wrist pin. While you have the piston in the lathe, cut a square groove in the lower edge of the ring groove, above the wrist pin. Then drill several small holes in this groove, slanting them inward. The groove and small holes help catch the oil and return it to the crankcase. It should be done only if the cylinder shows tendency to over-oil. Some clock springs now should be obtained, just wide enough to fit the grooves, and inserted under the piston rings. Crimp the springs before putting the rings in place. The pistons and connecting rod then can be reassembled and placed back in the engine. The idea of the springs under the rings is to absorb side slap before the top of the piston can hit the cylinder walls.

Another way to avoid regrinding or re-boring is to heat the piston evenly to a cherry red and allow it to cool very slowly so the piston will not warp. This expands the piston enough so it can be lapped down to size and then used over again. This process can be used but once, as the piston will not stand a second heat. Lap in the piston and rings with finely powdered glass, the job being done when the piston slides freely the entire length of the stroke and does not bind when twisted around in the cylinder. New over-size rings, of course, should be fitted to the pistons.

Engine Does Not Pull on Hill

Q.—I have a 1912 model M Vellie 40 which is not working as it should. It does very well when going over a comparatively level stretch of road, but when negotiating a hill or a climb it emits a gasping or choking sound or a muffled knocking sound from the engine, which from the seat appears to come from the rear right side. When running on the batteries, this sound will discontinue when I retard the spark, but when driving on the magneto the retarding of the spark makes no difference. This car is equipped with both systems of ignition, magneto and battery with Atwater Kent distributor. When operating idle, it seems to work all right and also when running at very high speed on the road, but when running at 12 to 25 miles this difficulty continually appears at every little pull and the engine slows down rapidly when this peculiar sound begins. Where can I look for this trouble and how can it be remedied?—E. C. Curfman, Maryville, Mo.

Such trouble as you are having may be caused by several things, especially in an old model. One of the first things to suspect is that one or more of the pistons are loose, setting up what is known as a piston slap. The knock which results from such a condition often can be remedied by retarding the spark. Also a loose piston is not always detected when the engine is idling, but the knock becomes very pronounced when the engine is pulling hard or speeded up.

Under these conditions lubrication is not always what it should be. The loose piston and rings allow the flame in the combustion chamber to get past the rings and down on the cylinder walls. This burns off the oil film, and consequently the walls become scored. The remedy for these conditions is to rebore and fit oversize pistons and rings.

Be sure that both ignition systems are in good order. It makes all the difference in the world how you set the points on both the magneto and distributor. Look over all the wiring, examine the brushes in the magneto and see that the high-tension cables are not oil-soaked. If you still are using the carbureter that came with

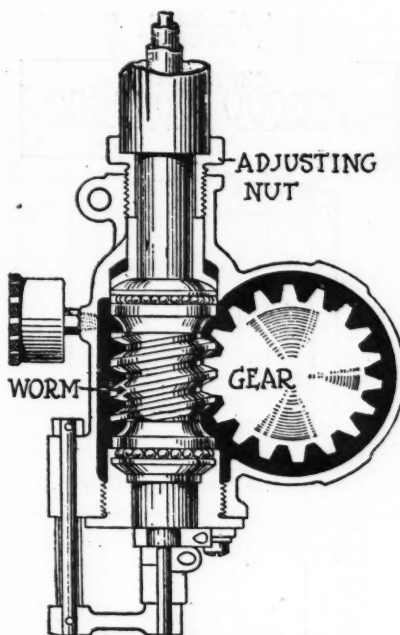


Fig. 6—Typical worm and steering apparatus such as used on Chevrolet

the car we would suggest that you replace it with a more modern instrument. Your trouble also may be caused by improper seating of the valves. Also the valve guides may be worn to such an extent that some of the intake valves suck in a lot of air and thus upset the mixture. Leaks in the intake manifold joints or carburetor flange would do the same thing. You can ascertain this by squirting gasoline from an oil can around the manifold joints. If the engine picks up in speed, there are leaks.

All these things may be responsible for your trouble but the first things to go after are the pistons and cylinders, mentioned first. If possible, test the compression of each cylinder when the engine is hot and also when it is cold. No engine will run right if the compression is not equal in each cylinder. They should test about 65 lb. each.

The Electric System

Charging from Alternating Current

Q.—Publish a diagram showing how to charge storage batteries where we have alternating current, 115 volts, 60-cycle, single-phase.—Oland Heskett, Hillview, Ill.

To charge a storage battery, it must be connected to source of electrical energy which will produce a uni-directional, or direct, current through the battery in a direction opposite to the direction of the electrical pressure of the battery. Such a source of electrical energy is not always available, but very often a source of electrical energy capable of producing an alternating current is available and in such cases it is necessary to change the alternating current into direct current, in order that use may be made of the source of energy in charging the battery. The purpose of the electrolytic rectifier is to change the alternating current into direct.

The operation of the electrolytic rectifier is based upon the simple fact that certain electrolytic cells, having electrodes of different metals, will allow a current to pass through them in one direction without offering very much opposition but will offer a high resistance to the current passing through the cell in the opposite direction. For example, if a plate of iron and a plate of aluminum be immersed in a solution of ammonium phosphate as shown diagrammatically in Fig. 8 and the two plates thus connected to a source of alternating pressure, the following results will be obtained:

Current Alternates

The alternating pressure between the terminals of the cell A and B tends to send a current through the cell first in one direction and then in the opposite direction and if the resistance of the cell were independent of the direction of the current, an alternating current would be produced and this current could be represented by a curve of the form shown in Fig. 12, in which the distance of the curve above or below the line corresponds to the value of the current, the current being in one direction when the curve is above the line and in the opposite direction when below the line. Quite a high resistance, however, is offered by the electrolytic cell when attempt is made to send a current through the cell in a direction from the aluminum to the iron plate. As a result of this high resistance to the current, there is, in reality, practically no current through the cell in one direction, as compared to the value of the current through it in the opposite direction. This results in the current curve being of the general form shown by

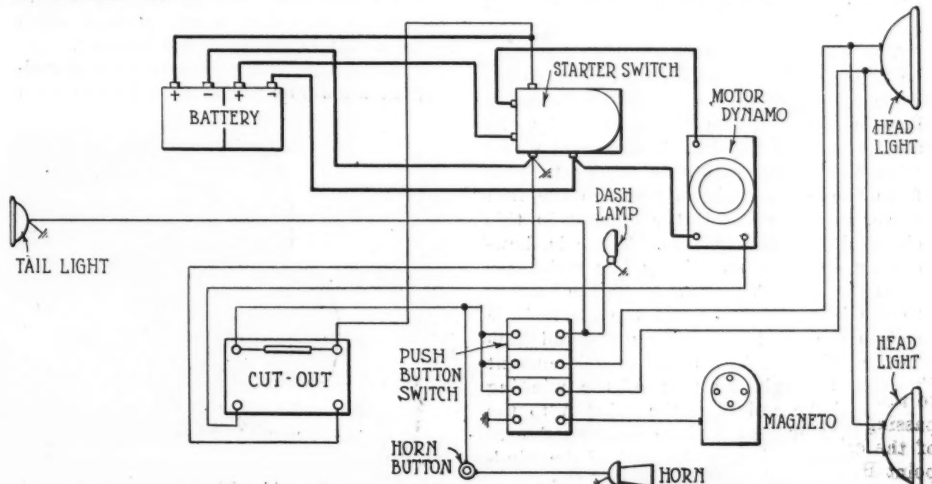
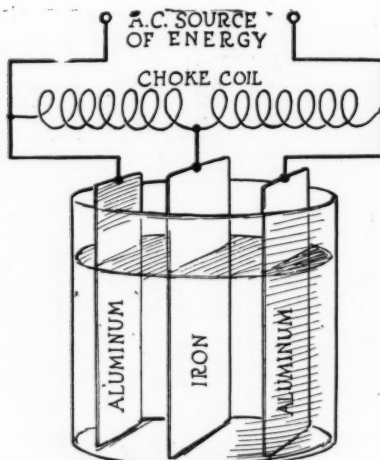
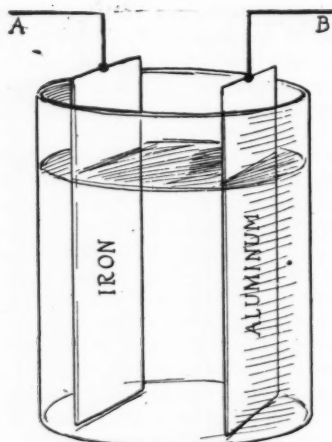


Fig. 7—Wiring diagram of electric system used on 1915 Pullman



Figs. 8 and 9, left to right—Immersion of plates in solution in home-made rectifier

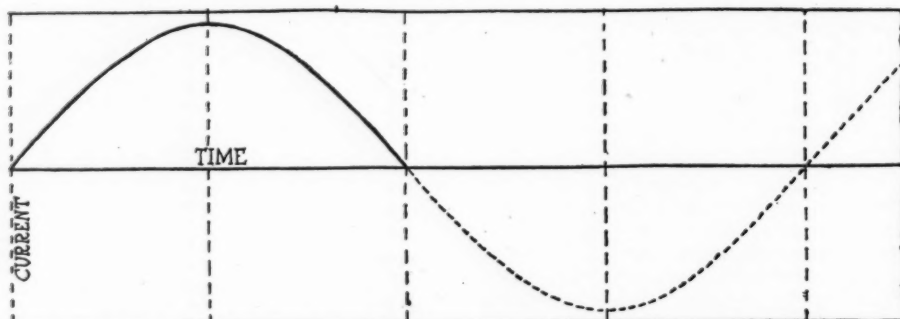


Fig. 10—Current curve when direction is from aluminum to iron plate

the full line in Fig. 10. The dotted portion represents the part of the current curve shown in Fig. 12, which has been reduced to practically zero by the action of the electrolytic cell. The high resistance offered by the cell supposedly is due to a high-resistance film formed at the surface of the aluminum when the current is in the direction from the aluminum to the iron plate.

In the case just described, use is made of the available pressure just half of the time, hence there is current in the circuit only half of the time. A storage battery connected in such a circuit could not be charged very satisfactorily or efficiently. A better arrangement of the cell may be made as shown diagrammatically in Figs. 9 and 13. Two aluminum plates are used instead of one and they are connected to the alternating source through what is called a choke coil, as shown in Fig. 9.

The operation of this combination may be followed briefly as follows: Let us assume a current in the alternating current line in the direction is indicated by the arrows marked 1 and 2. The current meets with a high opposition in trying to pass from the left aluminum plate to the iron plate, and as a result the current in this circuit is practically zero. There is, however, a circuit of relatively low resistance from the point A to B, through the battery to the iron plate, through the electrolytic cell to the right aluminum plate and then to the point C. As a result of this current passing through the part of the winding of the choke coil from the point A to the point B, a current will be induced, due to transformer action, in the part of the winding between points B and C, and the direction of this induced current will be from

the point C to the point B, where it combines with the current from the point A and gives the total current through the battery. This results in a current in the battery approximately twice as great as the current in either part of the winding of the choke coil.

When the current in the alternating-current circuit reverses, there will be no change in the direction of the current through the two sections of the choke coil, but both currents will still be toward the point B and through the battery, which results in the battery current being of the general force shown in Fig. 14. The dotted portion of the curve which was lost by the arrangement shown in Fig. 8, is now reversed in direction relative to the upper loops, and as a result all the current loops above the horizontal line, or the current through the battery is more nearly continuous in value, which gives a much better result in charging the battery.

If the electrolytic cell is to be self-cooling, the aluminum plates should be of such

a size that there are about 7 sq. in. of surface for each ampere of direct current and the iron plates should have at least twice or, better still, three times the area of the aluminum plates. The distance between the plates should be about $\frac{1}{2}$ in. The containing vessel should be, if possible, of such a size that there is about 1 sq. ft. of radiating surface for each ampere of direct current. A good size granite bucket will serve very well for a containing vessel. The dimensions of the plates may be made such that they will best fit in the containing vessel and small ears may be left on their upper corners to be used as terminals and as means of supporting them from small wooden strips laid across the top of the bucket. The electrolyte should be an approximately neutral solution of pure ammonium phosphate.

The size of the containing vessel and also the area of the plates may be reduced considerably by using some artificial means of cooling, such as circulating cold water through pipes immersed in the electrolyte, or the electrolyte itself may be circulated through cooling coils outside the containing vessel.

Efficiency of Rectifier

The efficiency of such a rectifier at best is about 60 per cent and its operation as a whole is not very satisfactory. The direct-current voltage is less than half of the alternating current voltage. You must remember that the direct current through the battery is not steady in value but pulsates, and as a result a direct-current and an alternating-current ammeter will not indicate the same volume of current when connected in series with the battery, since the direct-current ammeter indicates the average current and the alternating-current ammeter the effective current.

With the arrangement shown in Fig. 13, it will be necessary to reduce the value of the direct-current voltage to charge a starting or lighting battery, if the source of alternating current is a 110-volt circuit. This reduction in direct-current voltage can be taken care of in several ways. A resistance may be connected in series with the storage battery and the value of the charging regulated by varying the value of this resistance as conditions may demand. Or, a resistance may be connected in series with the choke coil and the alternating voltage actually applied to the choke coil terminals adjusted to meet the requirements, when the rectifier is operating by varying the value of the resistance. Both of these methods are very inefficient, as there will be a considerable loss in the

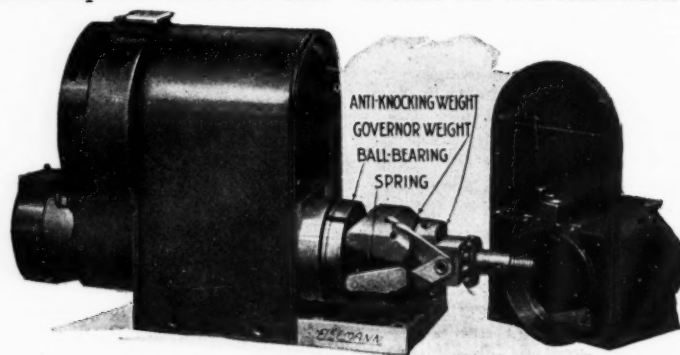


Fig. 11—Eisemann magneto with automatic spark advance, with governor weights and other parts

resistance, depending upon its value in ohms and the current through it. A more efficient means of reducing the voltage applied to the terminals of the battery circuit is to use a small transformer with several secondary taps, which give different values of secondary voltage and hence the direct-current voltages will be different.

A choke coil that can be used on a 110-volt alternating-current circuit can be made by winding 300 turns of No. 16 B. & S. gage cotton-covered copper wire on an iron ring having a mean diameter of about 5 in. This ring can be made by winding a quantity of soft iron wire in a suitable form of some kind until the area of the cross-section of the ring is about 1 sq. in. A choke coil of this kind should be capable of taking care of about 8-amp. direct current, and the direct-current voltage should be in the neighborhood of 20 to 50 volts. In winding the ring, do not forget to make an electrical connection at the center of the winding.

Wiring of 1915 Pullman

Q.—Publish wiring diagram of 1915 Pullman car.—J. E. Harris, La Harpe, Ill.

This diagram is shown in Fig. 7.

What Automatic Advance Is

Q.—How is the spark controlled on Bosch magneto DU4, model 5, on which the breaker box housing is fastened solidly to the magneto and no arrangement made for attachment for spark control from dash or steering wheel? Is this what is meant by automatic spark control? Explain how automatic spark control is accomplished, giving cut.—E. A. McCune, Carnegie, Pa.

This is known as first-spark ignition. The armature is so set that the spark occurs at the correct time in relation to the piston travel regardless of whether the engine runs slow or fast. The spark, as the instrument revolves faster, becomes more intense and thus automatically advances. On starting the spark is sufficiently strong to ignite the charge, yet not so strong as to cause a kick-back, even though the spark takes place before the piston has reached top dead center. One of the disadvantages claimed for the set spark is that on a hill the spark cannot be retarded and the engine is liable to knock.

Automatic advance differs from the fixed spark in that the magneto is provided with a governor which by centrifugal force retards or advances the spark, as the engine is slowed down or speeded up. The Eisemann GA4 magneto, shown in Fig. 11, is an example of this. The automatic control of the spark is accomplished by the action of centrifugal force on a pair of weights linked at one end to a sliding block, through which runs the driving spindle of the magneto, and hinged at the other end to the armature itself. Along the armature spindle run two helicoidal splines which engage in similarly shaped grooves in the sliding block. A coil spring pressing against this block keeps the governor normally closed when the engine is running very slowly. In this position the spark is fully retarded.

As the engine speeds up, the centrifugal force causes the governor weights to spread out, drawing the sliding block lengthwise against the spring and compelling the helicoidal splines to cause angular displacement of the block, thus advancing the armature relatively to the

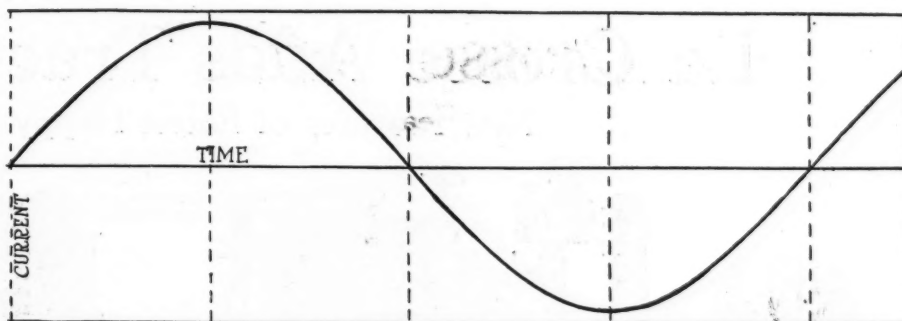


Fig. 12—Curve of current if resistance of cell were independent of direction of current

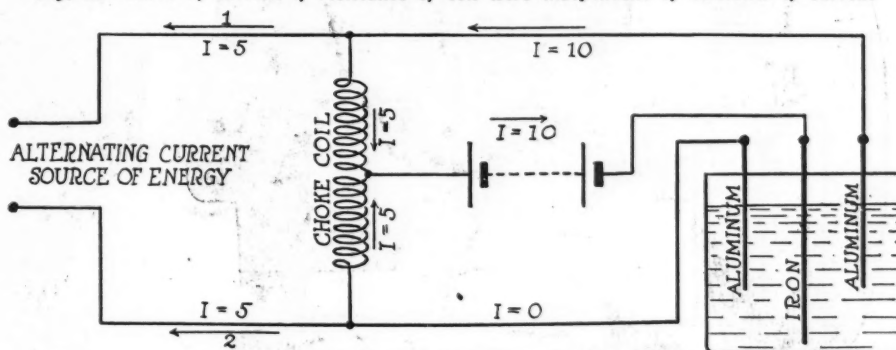


Fig. 13—Arrangement of rectifier in which a choke coil is used

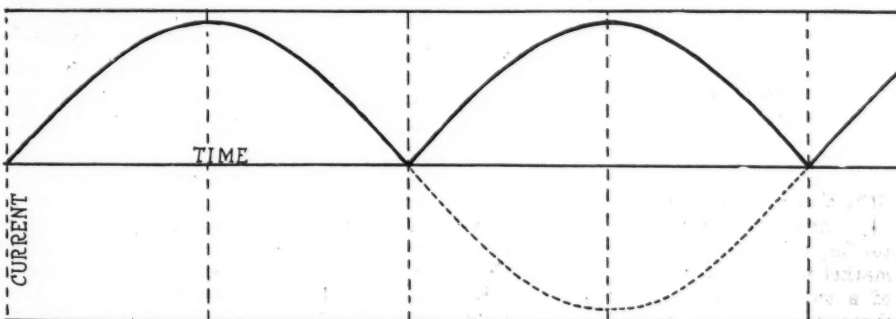


Fig. 14—Curve of current with arrangement as in Fig. 13

shaft and consequently the engine itself. Naturally, the greater the engine speed, the further will the sliding block travel, and the greater will be the amount of the advance. When the engine speed decreases the action of the helicoidal sleeve is reversed and the spring gradually closes the governor and retards the spark.

With this method of advance the moment of induction is brought about earlier by moving the entire armature and with it the contact rocker-arm. The breaks in the primary circuit are fixed in the correct position to cause the break to occur at the moment when the current in the winding is strongest.



WOULD HAVE FEWER TRAVELING

Barnesville, S. C., June 5—Editor MOTOR AGE—To-day several hundred thousand young men register in response to the call of their Government. The country needs these men, else they would not be re-

quired to enroll. In every paper, magazine, and trade journal we see the needs of the Government for men.

These periodicals also stress the fact that those that cannot fight should be at some "useful service," and it has occurred to us that there is one source of supply that could be utilized to advantage.

This is the traveling salesman; apparently there is no decrease in the number of men on the road. From one to a dozen call on us daily. In one week eight tire men came—all with the same song and story.

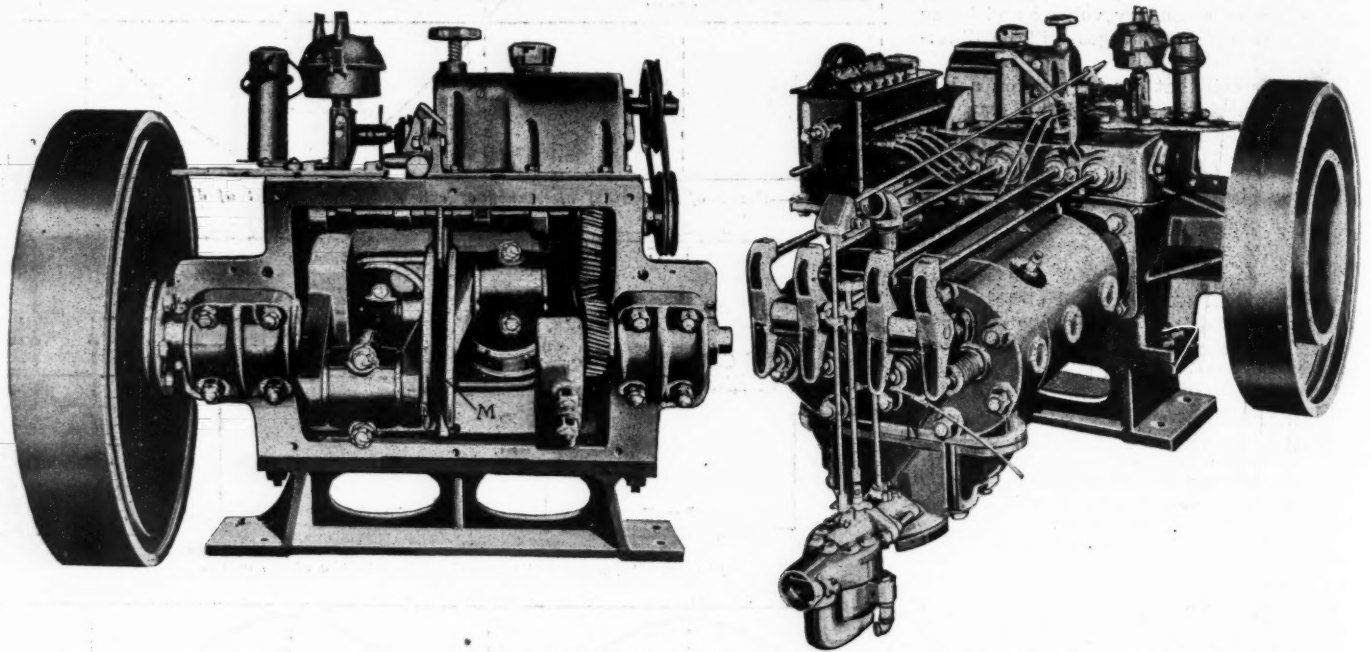
Ninety per cent of these men could do something more useful. Few business men are in business to-day who cannot send their orders direct and who do not know their wants better than the average salesman, to say nothing of the time wasted by both in spouting hot air.

We have decided not to give salesmen any orders and thus do our part toward releasing several for work at the front or "useful service" in some other manner.

One of our firm is now in service, and every man in our shop has offered his services to the War Department but unfortunately were rejected on account of age or other reasons. We mention this fact to show that we are not asking others to do what we are not willing to do ourselves.—J. J. Vickery, Vickery Brothers.

La Crosse Adds Tractor Model

New Features of Latest Happy Farmer



La Crosse engine with front of crankcase removed, left, showing crankshaft and crankshaft bearings. M—Disk for patent oiling device. Note extreme accessibility of crankshaft. At the right is the front of the engine, showing the arrangement of the valves, and at N, pipe for gasoline jet for starting

THE new model F Happy Farmer tractor, which is the model the La Crosse Tractor Co., La Crosse, Wis., is putting upon the market this year, retains the basic features of a twin-cylinder, horizontal engine, the three-wheel frame construction, low center of gravity, short turning radius and light weight which characterized the two previous models. In the new model the cylinder bore has been increased to 6 in. The pipe member of the frame has been lengthened to give the tractor better balance, increasing the length over all to 153 in. The removable cylinder head has been shortened and the combustion chamber has been brought entirely within the cylinder. A gasoline primer for starting has been installed. A device for changing from gasoline to kerosene, which is practically automatic in its operation, has been perfected. A complete new oiling system which uses the lubricating oil three times and obviates the necessity ever to drain the crankcase has been adopted and a centrifugal air cleaner of novel design and principle has been added as regular equipment. These, with some few other minor refinements, distinguish the model F from the models which preceded it and are in line with advanced ideas of tractor construction.

Weights 3800 lb.

The Happy Farmer tractor weighs 3800 lb., distributed 88 per cent on the drive wheels and 12 per cent on the front steering wheel. It is rated at 12-24 hp., developing 24 hp. on the belt at a pulley r.p.m. of 750, and has a guaranteed pull of 2000 lb. on the drawbar at a normal speed of $2\frac{1}{2}$ m.p.h. The front axle is solid and the rear axle live, the latter being 2 in. in diameter. Final drive is through bull pin-

ions on a $1\frac{1}{4}$ -in. jackshaft. It has a turning radius of $8\frac{1}{2}$ ft. and by means of a differential brake practically can be pivoted on either drive wheel and will turn either to the right or the left in a circle with a diameter but little in excess of the extreme length of the tractor. It has but one speed forward or reverse, $2\frac{1}{2}$ m.p.h. The drawbar is of the swinging type, attached midway between the drive wheel, is 16 in. from the ground and has a lateral and vertical adjustment of 30 in. and 3 in. respectively. The Happy Farmer sells for \$1,075 f.o.b. La Crosse, and is distributed exclusively through wholesale distributors. Production for the current year will be about 4000.

The engine is of the company's own design, with 6 by 7 in. twin, horizontal,

valve-in-head cylinders, cast in block and designed especially for the burning of kerosene. It has $2\frac{5}{8}$ -in. valves and a normal r.p.m. of 750. The engine starts on gasoline, a primer shooting a spray of atomized gasoline directly into the combustion chamber. A switch on the engine is turned and under the compression due to the turning of the flywheel the jet of gasoline is forced into the combustion chamber by a plunger. Another turn of the flywheel and the engine starts.

The change from gasoline to kerosene is practically automatic. A device, which is operated from the driver's seat, screws down the needle valve in the carburetor so that it is not flooded during starting and does not have to be drained. After the engine starts the needle valve in the

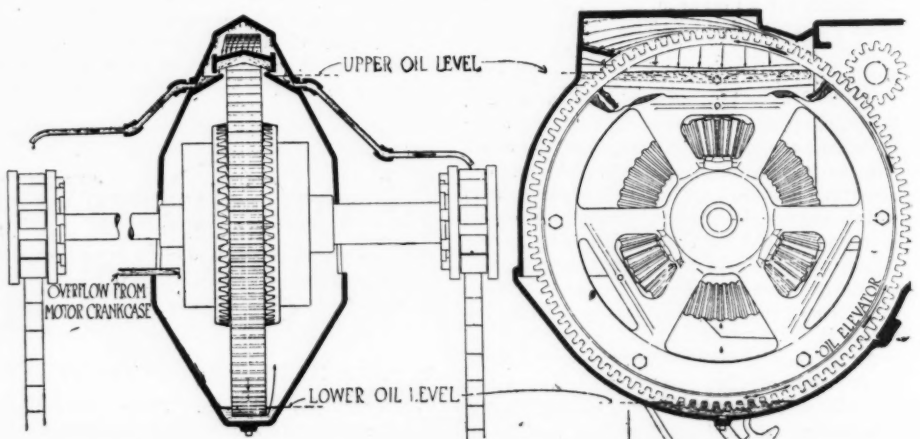
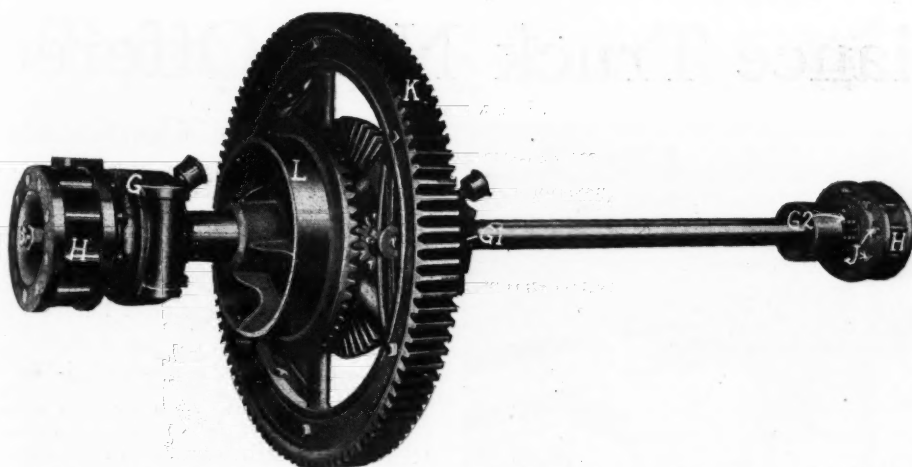


Diagram of the new Happy Farmer patent oiling system



Differential and jackshaft. H—Heat-treated steel rollers on bull pinion. G, G1, G2—Hyatt roller bearings. K—Semi-steel cut differential ring. L—Differential brake for short turn

carbureter is released and the engine begins using kerosene directly from the carbureter without further manipulation. It is claimed that this is a saving in time and fuel as the engine starts almost instantly and there is no waste of kerosene through the carbureter.

Short Intake Manifold

The intake manifold is very short and is surrounded by the exhaust and after the engine has been running a few minutes the manifold becomes so hot that vaporization of the kerosene is assured. A 1½-in. Kingston carbureter is used and as the opening of the intake valve is retarded until a vacuum can be formed in the combustion chamber the vaporized kerosene rushes in with such speed that it has no time to recondense. The fuel enters the combustion chamber at a temperature from 40 to 50 deg. higher than atmospheric. The exhaust is integral with the frame, is relatively noiseless and is free from back firing.

The crankshaft is drop-forged, 2½ in. in diameter, with two main bearings, 2½ by 5½ in. Connecting rod bearings are 2½ by 3½ in. Bearings are die cast with high-grade babbitt and backed with bronze bushings. The main bearings are lubricated by centrifugal force through a drilled crankshaft to the center of the bearings. The governor is of fly-ball type with quick adjusting screw. Ignition is by Atwater Kent equipment, with automatic retard and advance of spark.

The cooling system is by circulating pump, Spirex Modine radiator and fan. The cylinders are completely waterjacketed and there is circulation both between and completely around them and around the valves in the head. The capacity of the cooling system is 9 gal. and the fan is belt driven and runs at a r.p.m. of 2100. The fan belt is equipped with belt tightener.

Lubrication is by force feed from a Madison-Kipp 5-oiler, driven by belt, through a patented internal lubricating device. This is one of the distinctive features of the Happy Farmer tractor and is of the company's own design. A single pressed steel oil ring is centered on the crankshaft midway between the two main bearings. In appearance this resembles two eccentric

concave disks joined together on their convex sides. This ring is fitted with a double flange on its periphery. As the oil is fed to this ring in a jet from the Madison-Kipp oiler it is thrown by the eccentricity of the disks first to one side of the ring and then to the other. At the periphery it is caught by the double flange and is fed by centrifugal force to the center of the main crankshaft bearings through holes drilled in the crankshaft.

From the main bearings the oil is caught in a receptacle at the bottom of the crankcase, protected by baffle plates from contamination by any kerosene which may have got by the piston rings, so that no oil mixed with kerosene can touch the connecting rod bearings. From this receptacle the oil is drained to the gearcases and after being used there is conveyed mechanically to the final roller drive pinions. This uses the oil three times and at no place in the system can it be mixed with kerosene. This also obviates the necessity for draining the crankcase.

The clutch is of the contracting-band type and is of the company's own design. The gearset is sliding-gear type, running in oil, with Hyatt bearings. Differential and final drive bull pinions are mounted on jackshaft. The differential ring gear is not integral with the spider but is a semi-steel ring with cut teeth. For assistance in turning in short radius a differential brake is used. The differential gears are

inclosed in a dust-proof case and run in oil.

Final drive is through open bull pinions on jackshaft, with ¾-in. heat-treated steel roller pins, meshing with internal, sectional bull gear on the drive wheels. The gear ratio is 42 to 1. The bull pinions are protected only by mud guards but are lubricated mechanically with oil conveyed from the gearcases. The bull gear is cast semi-steel, in four segments which are reversible and interchangeable, and are attached to the wheels by ⅝ in. drive fit bolts to insure their not working loose.

The frame of the Happy Farmer is a solid piece of cast steel, annealed, and provides a foundation for the whole machine. The front extension is pipe, supporting at the front end the cast bracket to carry the steering wheel yoke. The steering post carries a worm at the front which meshes with a gear at the top of the steering wheel yoke. The steering wheel and the right drive wheel run in the furrow and steering is practically automatic when plowing. The steering wheel is bushed.

A feature on the Happy Farmer is the centrifugal air cleaner. This is a cylindrical, dipper-shaped device, the large open end of which is held against the radiator opposite the hub of the fan by a spiral spring. The cylindrical tube of the cleaner connects with the carbureter intake. Air is drawn through the radiator and the theory is that the centrifugal force of the fan will clean it of all dirt, dust and grit by throwing these substances to the outside, leaving the air around the hub clean and pure. Also the air is slightly warmed during its passage through the radiator.

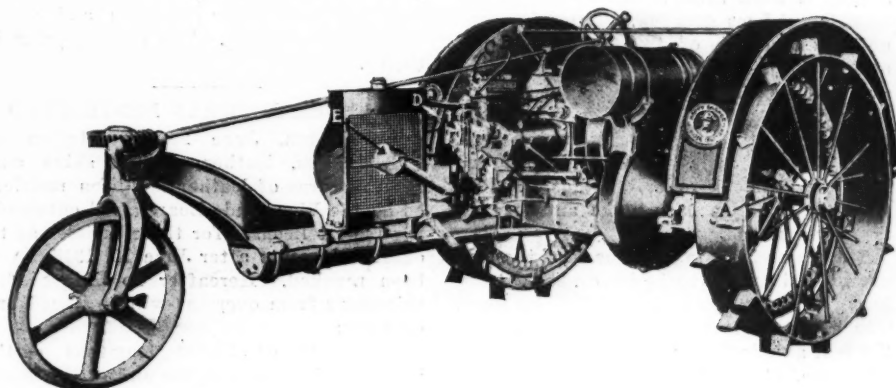
Specifications

Condensed specifications on the model F Happy Farmer are as follows:

A three-plow tractor with two drive wheels and one steering wheel running in the furrow: 12 hp. on the drawbar, 24 hp. on the belt; 2000 lb. pull on drawbar guaranteed at 2½ m.p.h.; operating weight 3800 lb.; turning radius, 106 in.; retail price, \$1,075, f. o. b. factory. Engine, own, valve-in-head, twin-cylinder horizontal, 6 by 7 in.; normal compression, 38 lb.; 750 r.p.m.; fuel, kerosene.

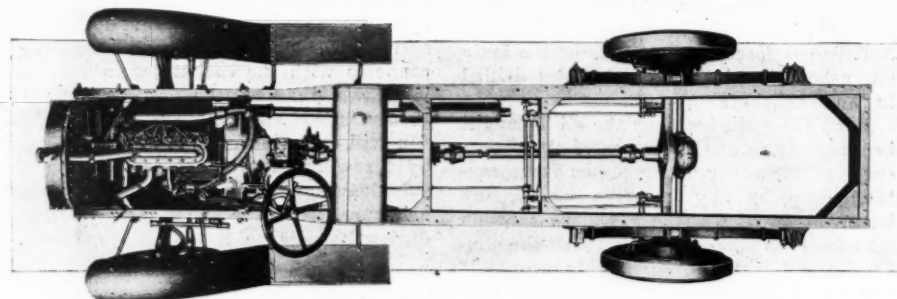
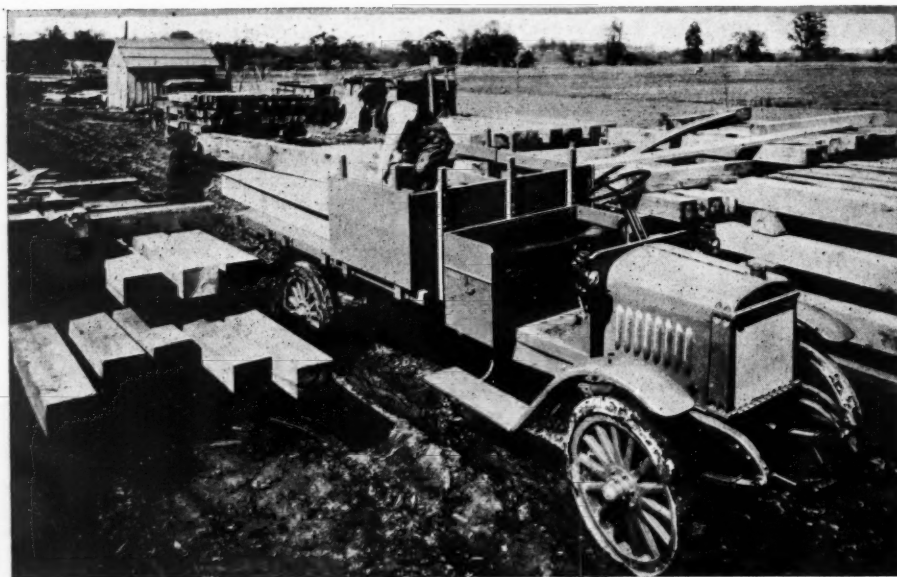
Lubrication: Madison-Kipp force-feed oiler; internal gears and bull pinions oiled by own patented system of oil distribu-

(Concluded on page 40)



Three-quarter view Happy Farmer tractor. A—Mud guards over bull pinion. B—Needle valve of carbureter adjustable from operator's seat. C—Madison-Kipp oiler. D—Wick oilers on rocker arms. E—Centrifugal air cleaner

1½-Ton Defiance Truck Now Offered



Two views of the Defiance 1½-ton truck, showing it at work and an airplane view of the chassis

THE Defiance truck, which is a product of the Turnbull Motor Truck & Wagon Co., Defiance, Ohio, is now offered in 1½-ton capacity with a Continental Red Seal engine of the heavy-duty type, the bore and stroke of which are 3¼ by 5 in.

Ignition is by Eisemann high-tension magneto, and the carburetor is a Stromberg with hot-air connections to manifold for heating the intake. The governor is a Monarch. Air control is provided on the dash for starting. Drive is taken through a Borg & Beck three-plate dry-disk clutch to a Grant-Lees gearbox. The driveshaft unit is made up of two Arvac inclosed universal joints and tubular propeller shaft. The rear axle is a Torbensen new improved internal gear, with differential and wheels mounted on roller bearings, while the front axle is a heavy drop-forged I-beam with Bock roller bearings. A Perfex radiator with cast tanks and tractor-type core is used.

The frame is 34 in. wide back of the cab, narrowed in front to facilitate short turning. It is 199 in. long and 5½ in. deep. The distance from the rear of the cab to the rear axle is 72 in.; from rear axle to end of frame, 44 in. The frame is carried on semi-elliptic springs 42 by 2¼ in. in the front and 54 by 2½ in. in the rear. The springs are of alloy steel and contain bushings in all the eyes. The spring bolt diame-

ter is 1 in. and is lubricated by wick type oiling. The wheelbase is 135 in. with 56 in. tread. The wheels are artillery type with fourteen spokes and carry 34 by 3½ in. tires in front and 34 by 5 in. in the rear, pressed on.

The brakes are 15-in. internal expanding and external contracting. Steering gear is heavy worm and full gear located on the left side, with an 18-in. steering wheel. Equipment includes driver's seat, one-piece heavy crowned fenders, running boards, three oil lamps, horn, odometer, tool kit, tool box and jack. Express and stake bodies are supplied. The chassis price is \$1,795.

LEATHER IMPORTS RESTRICTED

Washington, June 28—Importation of hides, skins, leather, tanned skins and manufactures of leather has been restricted by the War Trade Board. All outstanding import licenses for these articles as to ocean shipments after June 15, 1918, have been revoked. Hereafter no licenses for shipments from overseas will be issued except for:

Shipments of 57,000 long-tons cattle hides of specified weights and grades from South America.

Shipments of other grades of hides or skins, leather tanned skins or leather manufactures, from any Allies or neutral coun-

Fitted with Continental Heavy-Duty Engine

tries as may be certified by the War Industries Board.

Shipments over land from Canada or Mexico or as back haul from Europe will be allowed.

ONE WORD CHECKS LAW

Des Moines, Iowa, June 28—The omission of the word "not" has proved a stumbling block to the enforcement of the Iowa law against glaring headlights. While the presiding judge interpreted the law by the spirit, though admitting that the intent of the law had been nullified by the omission, the defendant in the test case will carry the case to the Supreme Court. The law is:

"Provided, however, that it shall be unlawful for any person operating a motor vehicle upon the public highway in this state to use any lighting device of over 4 cp. equipped with a reflector unless the same shall be so designed, deflected or arranged that the directly reflected and undiffused beam of such light, when measured 75 ft. or more ahead of the light shall rise above 42 in. from the level surface on which the vehicle stands under all conditions of load."

The law should read "... shall not rise above 42 in. from the level surface . . ."

CASTOR SHIPMENTS RESTRICTED

Washington, June 28—Importation of castor beans or castor oil from the West Indies, Mexico, Central America, Colombia and Venezuela is prohibited by the War Trade Board except when the United States Government is the consignee or when the importation is approved by the Bureau of Aircraft Production. Licenses for importation of castor beans and castor oil have been revoked as to shipments made after June 10, 1918.

MODEL F HAPPY FARMER

(Concluded from page 39)

tion. Bearings: front wheel, plain; all others, except engine, Hyatt bearings.

Gearset: sliding gear type, inclosed, running in oil; one speed forward and reverse. Final drive: Roller pinions on jackshaft and internal gear on drive wheels. Drive wheels: 56 in. high, 10 in. tread. Pulley: 11 by 7½ in., 750 r.p.m.; controlled through clutch and driven direct from engine; belt speed 2100 f.p.m.

Fuel tanks, two; kerosene, 13 gal.; gasoline, 2 gal. Oil capacity, 1 gal. Centrifugal air cleaner. Ignition: Atwater-Kent, distributor system. Own governor, fly-ball type.

Carburetor: Kingston, single bowl, 1½ in., mixture heated from exhaust. Cooling: Circulating pump, Modine radiator. Spark plugs: Champion, ½-in. pipe thread. Piston rings, four; diameter, 5.75 in. width, 0.25 in. Hitch: height, 16 in., lateral adjustment, 30 in., vertical adjustment, 3 in.

Triangle 1½-Tonner Is Put on Market

First of Line Which Will Include Four Models

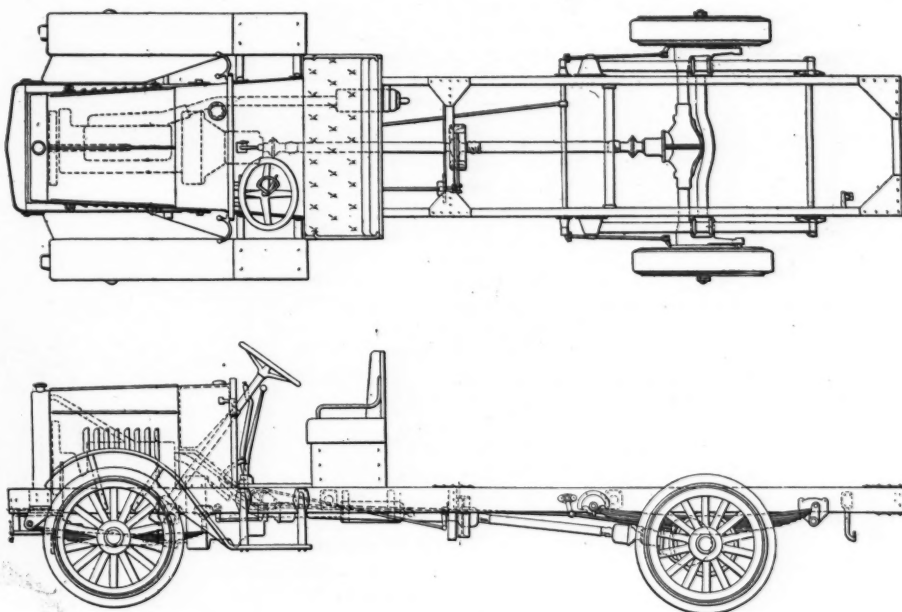
THE Triangle Motor Truck Co., St. John's, Mich., is making deliveries on a new 1½-ton truck, designated as model A. Eventually the Triangle line will include a 2½, 3½ and 5-ton model. The 2½-ton model will be ready for delivery about Oct. 1. Model A has a 144-in. wheel-base with an over-all length of 218 in. Specifications include Waukesha engine, Eisemann magneto, Stromberg carbureter, Fuller transmission, Celfor internal gear axle, Torbenson front axle, Detroit springs and Gemmer steering gear. The turning radius is 23 ft. 6 in., clearance in front 9½ in. and rear 12¼ in. The frame is channel section 6 in. deep, strongly reinforced with cross-members and gusset plates. The frame is tapered slightly at the engine location and carried around in front of the radiator, serving as a bumper. It is mounted on semi-elliptic springs, the rear having ten leaves and the front seven. All springs are bronze bushed. The dimensions of the frame back of the seat are 34 in. wide and 126 in. long. The steering column is placed at a slight rake and fitted with an 18-in. wheel. The front tires are 34 by 3½ in. and the rear 34 by 6, being of pressed-on type.

Engine 3¼ by 5½

The engine is conventionally placed and has a bore of 3¼ in. by 5½-in. stroke. Cylinders are cast in pairs and cooling is by pump circulation through a large capacity radiator. The magneto is located on the right side and driven from pump shaft. The timing gears are helical cut, there being four all told, one on the crankshaft meshing with the half-time gear or camshaft, which in turn drives the pinion operating the pump and magneto shaft. Meshing with the large cam gear is a gear of the same diameter for operating the governor. The operation of the governor is as follows: Two circular weights behind the driving gear tend to move outward as the speed is increased. The action presses a ball-bearing thrust outward in proportion. By a series of levers the butterfly valve on carbureter is closed or opened as the engine speed is advanced or retarded.

The valves are placed on the side of the engine and operated by pushrods of the follower type. The driving mechanism is inclosed and provision for oiling made by allowing the oil mist from the crankcase to come into this compartment. The valve guides are exceptionally long, protecting the valve seat from unequal wear. Lubrication is by force feed with the oil filler cap mounted at the forward end of the engine in a convenient place. A gage at the center between the two cylinder blocks indicates the amount of oil carried.

The gasoline tank is mounted just back of the engine ahead of the dash and has a large filler cap at the top. Feed to the carbureter is by gravity, the carbureter



Two views of the Triangle 1½-ton truck, showing a side view of this model and an airplane view of the chassis, above

being on the left side. Both intake and exhaust manifolds are held in place by clamps.

In unit with the engine is a Fuller gear-set from which the drive is taken by a short shaft to a bearing located about midships. Immediately behind the cross-member is one of the two universal joints, the other being at the axle end. Surrounding the first universal is a drum carrying the driveshaft brake, which is connected to the foot pedal. The hand brake operates those on the rear wheels. One of the chassis lubrication features is the absence of grease cups, these being replaced entirely by oil cups.

CAMPBELL ON "BIG TIME"

Boston, Mass., June 28—Chester I. Campbell, manager of the Boston motor car shows, has been asked by the Government to take charge of several educational exhibitions which it is proposed to put on during the next few months throughout the country. He has accepted and the first exposition will be on the Pacific Coast. There will be others in big cities from time to time. The details will be placed in Mr. Campbell's hands.

OLDS TO BUILD OWN ENGINES

Lansing, Mich., June 28—The Olds Motor Works are erecting a new building for the manufacture of engines for its car, which heretofore have been supplied by the Northway Motor Co., Detroit, one of the branches of the General Motors Corp. The new building, which will be 500 by 240 ft., and loading dock, 700 by 60 ft., will cost \$600,000, and an additional \$500,000 will be spent in equipping it. The addition is made necessary by the fact that the Northway company is engaged in war work and cannot furnish engines for the

Oldsmobile. Contract calls for completion of the new plant by Nov. 1, and operations will be started about Jan. 1, when from 1500 to 2000 additional employees, both men and women, will be placed on the pay roll. Plans call for separate locker rooms and rest rooms for the women. There also will be a convention lunch room where department heads may gather for meals.

TURNBULL SALES AT DEFIANCE

Defiance, Ohio, June 28—The truck sales division of the Turnbull Motor Truck Co. has been transferred from Fostoria, Ohio, to the factories at Defiance. When the old Turnbull Wagon Co. was reorganized last fall for the manufacture of the Defiance 1½-ton motor truck, the sales division was established at Fostoria, the home of the Allen Motor Co., whose sales and advertising departments have built up a good Defiance dealer organization.

BOSCH MAGNETOS RE-CHRISTENED

New York, June 28—Insofar as Australia is concerned, Bosch magnetos are now known as Liberty magnetos. The change in name follows an order of the comptroller-general of customs for Australia prohibiting the importation of magnetos bearing the name Bosch. The magnetos themselves are not banned, but the name is, and, hence, on all shipments to Australia, Tasmania and New Zealand the name Bosch has been supplanted by the name Liberty. The edict applies to magnetos shipped separately or as part of the equipment of cars, trucks, motorcycles, etc., but instruments shipped prior to June 20 will be admitted under the name Bosch. The Bosch Magneto Co. expects to ship 7000 instruments during the current twelve months.

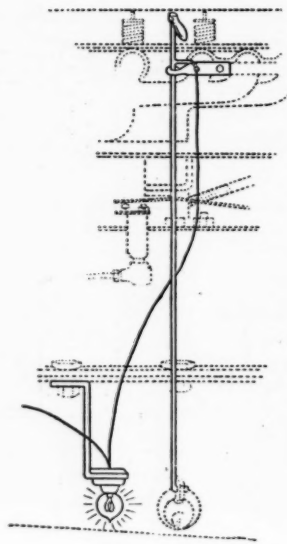
The Accessory Corner

Knickerbocker Form-a-Tractor

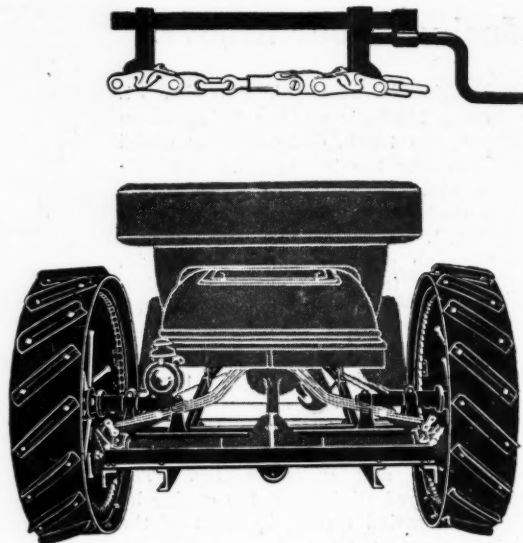
THE Knickerbocker is a 3-ton tractor for road use and consists of a heavy channel-steel frame which is placed under and supports a Ford car; a 2½-in. round axle with heavy artillery type wheels, provided with roller bearings, internal-gear drive; and external contracting 19 by 2½-in. brake, operated by a heavy lever anchored on the tractor frame. The table carrying the fifth wheel attachment is supported by springs 32 by 2½-in. set on a solid axle. The tractor has a wheelbase of 102 in. with an option of 114 in. if desired. The gear ratio is 14 to 1 on high and the speed is 6 to 10 m.p.h. When the load is distributed properly 1 ton rests on the tractor wheels and 2 on the trailer wheels. The tractor is clamped to the Ford frame without drilling or cutting and can be removed readily from one car to another. In attaching the Ford is not dismantled and every part is utilized except the rear wheels and rear fenders. Price \$4.50.—Knickerbocker Motors, Inc., New York.

Sperry Radiator

The Sperry radiator is a combination of the tubular and honeycomb types in construction and operation. The tubes of the core are pressed into the zigzag water walls and are a part of the walls. This gives a wide surface for the water to spread over and presents a surface sufficiently irregular to retard the flow of water and give it the maximum time in which to cool. Strength and durability are attained through the zigzag construction of the water walls, which when assembled form a sort of bridge construction, stoutly braced from top to bottom. This in combination with the vertical tubes pressed into the walls adds more rigidity. The surface is un-



Lamco oil sight for Buicks, left; special tool for adjusting Never-Skid device for dual tires, upper right; and Knickerbocker 3-ton tractor attachment



usually wide where the walls and spacers join and furnishes a broad surface for soldering, making the radiator core impervious to leaks as well as practically unbreakable, it is claimed. From the front the Sperry radiator looks very much like an ordinary honeycomb radiator, but a cross-section shows the zigzag canals through which the water circulates much as in the honeycomb type of radiator but giving more points of heat transit. Viewed from the top the effect is that of looking through numerous vertical tubes. This is due to the combination tubular and honeycomb construction. The cores are made in various

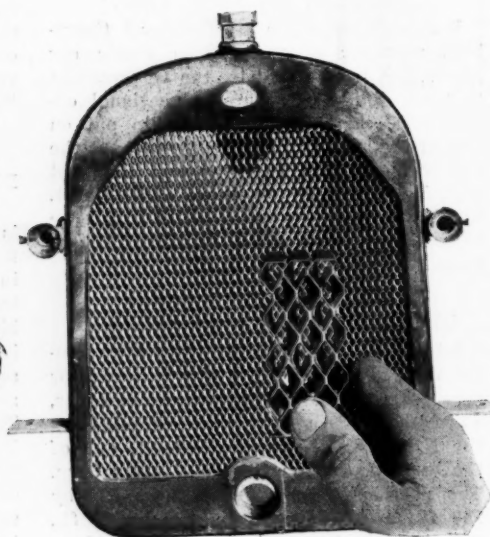
depths, namely, 2, 2½, 3, 4 and 5 in. A radiator complete except the casing is furnished for Ford cars. The Sperry is adaptable to truck and tractor service as well as to the passenger car by reason of its sturdy construction, and its resistance to frost, through the distribution in the zigzag canals and vertical tubes combined, also fits it for airplane use in the low temperatures of high altitudes, it is claimed.—Hooven Radiator Co., 417 South Dearborn street, Chicago.

Never-Skid

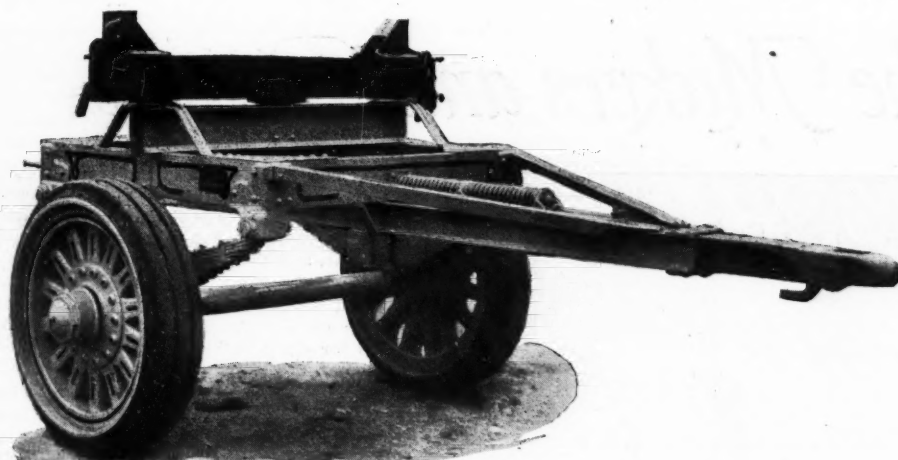
The Never-Skid device for dual tires consists of a series of cross pieces connected by flat link chains to form a continuous chain between the dual tires. The cross pieces are made up of hard steel wire. The ends are welded together in a clip, the wire then bent to the shape of the tires and held firmly to the connecting chain by drop-forged heat-treated link. The connecting chain is made up of flat links riveted together, in which drop-forged turnbuckles with inclosed thread are assembled to take up slack and for adjustment. An attaching tool is supplied with each set; this is for tightening the device on the tires. The device is the result of experience with various types of skid chains for six years, which this company has had.—Never-Skid Mfg. Co., 110 West Fourteenth street, New York.

Lamco Oil Sight

The Lamco oil sight for Buicks is a device to determine the oil level and can be installed in 15 min., it is said. With the Lamco oil light it is easy to determine the oil level at any time, day or night, without soiling the hands and clothing. The device is worked by turning the operating handle which is placed up above the engine,



Water spray brush for motor cars, left; and Sperry radiator, right, with insert showing detail of combination tubular and honeycomb construction



Model D30 Warner two-wheel, heavy-duty truck trailer

in a convenient position, thereby opening the oil level petcock and automatically lighting an electric lamp placed near the petcock and illuminating same thoroughly. The current for the lamp is taken from the lighting system of the car and involves practically no expense for operation. The device is designed to remedy the awkwardness that may arise from the position of the oil level petcock near the bottom of the crankcase, which makes it more inaccessible to operate as well as making it hard to discern whether the oil is flowing or not without the aid of a light. It also does away with the possible danger that may exist from using a match to determine the oil level. Price, \$3.75.—Limpp & Agee Mfg. Co., King City, Mo.

Warner Two-Wheeler

Several new and important features have been incorporated in the model D30 Warner two-wheel heavy-duty truck trailer. This trailer has a capacity of 11,000 lb. and when hitched to a truck the total hauling capacity of truck and trailer is 22,000 lb. A relief spring is inserted on the drawbar to take up the binding strain and to act as a snubber when starting. A swivel bolster is used, which automatically adjusts itself to the direction of the load when turning corners. Movable dogs are provided on the bolster so that any load from a single length of pipe or log to full capacity may be kept in position. A chain fastens these dogs to the trailer. A bolster for the truck bed is provided at an extra cost. All Warner trailers are provided with a ball and socket hitch which permits of perfect alignment and any relative position of truck and trailer. Warner trailers are made in two and four-wheel heavy duty types and the commercial high-speed light delivery types. There is also the Warner tourist trailer, intended for hitching to the rear of passenger cars.—Warner Mfg. Co., Beloit, Wis.

Water Spray Brush

The water spray brush for motor cars consists of a brush of the best grade of bristles, circular in shape, with a hose connection in the center through which water is sprayed. The patented part consists of an aluminum valve forming the handle of the brush and controlling the flow of water as the brush is used. An opening in the

bristles enables the user to direct a spray of water at a distance and increase the volume as desired. To use like a sponge, the spray is reduced to the amount necessary, the water coming through the bristles keeping them free of dirt, washing it off the car without scratching. An extension handle adapts the brush to work on motor car tops and places inaccessible for the hand. The brush has been adopted by various large fleet owners, among them Armour, who is using it in place of sponges.—Scully Jones & Co., Railway Exchange, Chicago.

Wilkinson Vulcanizer

The model C Wilkinson vulcanizer takes care of tire repairs ranging from a simple puncture to a blowout 20 in. long and all kinds of casing work, sections, retreads, reliners, etc. Included in the capacity of the machines are molds for curing 4½ and

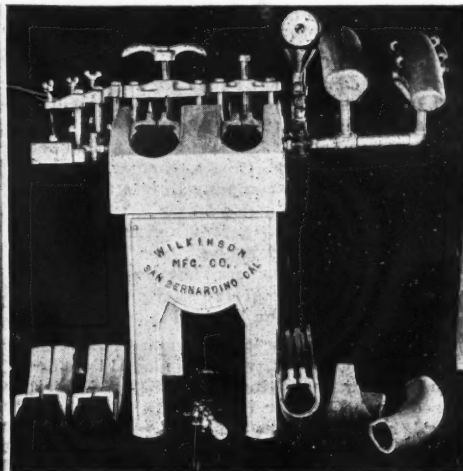
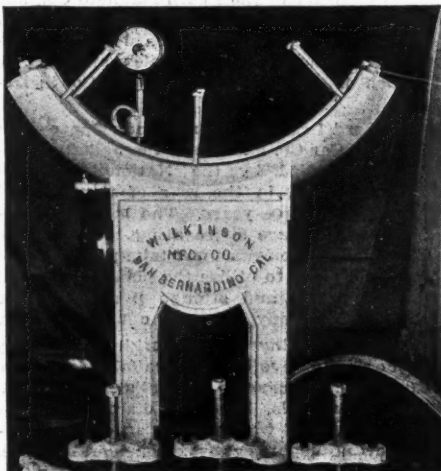
5-in. tires, 3½ and 4-in. tires, a reducing shell that takes care of all the common sizes of tires from the 30 by 3 to 37 by 5, five pairs of straight side and clincher bead molds for all common sizes of tires, inside mold for curing inside work on 3, 3½ and 4-in. tires, inside casing mold for 4½, 5 and 5½-in. tires, etc. The two inside molds, connected to the main mold by the steam cut-off valve, will take care of all kinds of inside repairs and relining work on all sizes of tires in common use. A 4 by 21-in. tube plate with its accessories will take care of all tube work in any ordinary size shop. A steam gage, an automatic steam safety valve and a petcock used to regulate the level of water in the molds, as well as a petcock in the ends of the inside molds to prevent dead air spaces while steaming up, are supplied. The vulcanizer is equipped with either gasoline or gas burners. Model C is 3 ft. 5 in. high over all and requires a floor space of about 26 by 40 in. Model H is a special retread mold for speedy work. It is a third of a circle and will vulcanize the retread on a small size tire a third at a time. It is equipped with its own gas burner, steam gage and safety valve and takes care of tires in 3, 3½ and 4-in. sizes. Two sizes of tube plates are made. Model A is a tube plate, 6 by 26 in. and model B, 6 by 36 in. Each tube plate has its gas or gasoline burner, steam gage, safety valve and stand. Prices, model C vulcanizer, \$170.50; model H, \$82.50; model A tube plate, \$38.50; model B tube plate, \$60.50.—Wilkinson Mfg. Co., San Bernardino, Cal.

Gordon Seat Covers

Gordon seat covers are made for all popular types of cars and are furnished for any make of car. Twenty-four materials compose the line from which to choose for 1000 cars. The covers are featured by the sectional overlap lazyback. This three-piece overlap construction provides an adjustment and guarantees a perfect fit, it is claimed. Reference to the illustration will demonstrate just how these covers are applied and from what they get their name of "tailored fit." Gordon also makes radiator and engine robes, rear curtain lights for Fords, Easy-On tire covers, etc.—J. P. Gordon Co., 302 North Fourth street, Columbus, Ohio.



Gordon three-piece lazyback seat cover



Wilkinson vulcanizers, model H retread mold, left, and model C for a variety of tire repairs

Among the Makers and Dealers



PUBLIC GARDEN STAGES WAR GARDEN—Right in the center of Detroit a Fordson tractor broke up the beautiful lawn of the public library to make a war garden. A fence was erected around the Victory garden, and expert gardeners designated spaces and seeds for planting. "A Wartime Service for America and Americans," the city of motor cars calls its garden

WELCH IS PROMOTED BY U. S. TIRE—

C. J. Welch, for five years manager of the truck tire department of the United States Tire Co., New York, has been promoted to the position of assistant sales manager of the organization.

Maynard Electric Is Building—The Maynard Electric Steel Casting Co., Milwaukee, Wis., has broken ground for a complete new electric steel foundry plant. The former plant has been acquired by the Globe Gray Iron Foundry Co., which will thereby be able to double its output. The new Maynard foundry will be 86 by 250 ft. and have a normal capacity of from 20 to 25 tons daily.

National Brake Erects New Foundry—The National Brake & Electric Co., Milwaukee, Wis., maker of gasoline engines, gasoline locomotives, heavy-duty tractors, etc., is spending about \$75,000 in the construction of a new gray iron foundry, core-room and auxiliary buildings at its main plant at the foot of Bellevue Place, which already is equipped with one of the largest steel foundry plants in the Northwest.

Personnel Changes at Federal—T. C. Beal, formerly commercial agent for the Michigan Central at Pittsburgh, Pa., has been appointed traffic manager of the Federal Motor Truck Co., succeeding H. J. St. Aubin, who has been drafted. George F. Currie, cashier, has also resigned from the company to join the colors. Since Jan. 1 the Federal Motor Truck Co. has manufactured 100 tractors and reports that the demand is increasing. The company is suggesting to its dealers that they take on a trailer line. Many of the tractors are being shipped South in the lumbering sections.

Changes Are Made at Saxon—The Saxon Motor Car Corp., Detroit, has moved its offices and is now occupying the building formerly used by the Pfeiffer Brewing Co. This building is situated across the street from the plant and is more convenient than the vacated location, which was several blocks away. The latter will be occupied by the Lalley Electric Lighting Co. J. H. W. Mackie, who has been

an assistant sales manager of the company since February, has been promoted to the position of general sales manager, to succeed H. S. Benjamin, who resigned.

Sibley Now With Packard—Hi Sibley, former advertising manager of the Republic Motor Truck Co., Inc., Alma, Mich., has joined the advertising staff of the Packard Motor Car Co., Detroit.

Richman Now With Allen—J. F. Richman, who resigned some time ago as factory manager of the Cole Motor Car Co., Indianapolis, Ind., is now associated with the Allen Motor Co., Fostoria, Ohio, in a similar capacity.

Price Manages Heath-Duplex Zone—R. J. Price, sales manager for the highway Tractor Co., Indianapolis, Ind., has resigned to become zone manager in the Southeast for the Heath-Duplex department of the McCord Mfg. Co., Detroit.

Hohenthal Eisemann Service Branch Manager—Elmer H. Hohenthal, formerly assistant sales manager of the Bosch Magneto Co., and more recently sales and advertising manager of the Simms Magneto Co., has been appointed manager of the sales and service branch of the Eisemann Magneto Co. in Detroit.

Packard Leases National Body Space—The Packard Car Co. has leased the buildings formerly occupied by the National Body & Trimming Co., in the rear of the Packard factory, for three years. The buildings contain a floor space aggregating 100,000 sq. ft. The Packard company will take possession in July and plans to utilize the plant for general manufacturing and storage purposes. The National company has gone out of business.

Falls Discontinues Woodworking Machinery—In order to devote every available facility to Government business, the Falls Motor Corp., Sheboygan Falls, Wis., has discontinued the manufacture of woodworking machinery, until now a department of considerable size. The unfilled orders for these tools will be handled by the Jenkins Machine Co., Sheboygan, Wis., which takes over all manufacturing

rights. The Falls plant is undergoing constant enlargement, but still is unable to cope with the requirements of the Government and its regular customers for passenger and commercial car, aviation and tractor engines.

DeCou to Manage Ross Factory—J. W. DeCou has been appointed factory manager of the Ross Gear & Tool Co., Lafayette, Ind. He was for eight years factory manager for the Thomas B. Jeffery Co., Kenosha, Wis.

McQuay-Norris Hoists Service Flag—The McQuay-Norris Mfg. Co.'s service flag has been unfurled again in St. Louis, Mo., after having been revised. It now contains fifty-eight stars.

Wonder Buys Comer Signal Device—The Comer Auto Signal Co., Sullivan, Ill., has been absorbed by the Wonder Sales Co., Cleveland, Ohio. The production of the Sullivan plant will be distributed throughout the United States and Canada and the output will be increased.

C. A. S. Continues to Build—The C. A. S. Products Co., Columbus, Ohio, has let a contract for an additional building on its new site, 25 by 100 ft. Rapid progress is being made by the same company on the 25 by 90 by 200-ft. building, to replace a structure recently destroyed by fire.

Laundry System for Tire Service—The Roberts Motor Tire Co., St. Louis, Mo., has adopted the laundry system of calling for and delivering commercial tires. The service wagon will visit the garage of each commercial tire customer twice weekly to pick up and deliver heavy tires.

Lloyd Heads Stewart-Warner Branch—Thomas W. Lloyd, recently manager of the Kansas City, Mo., branch of the K. P. piston ring, has been made manager of the St. Louis branch of the Stewart-Warner Speedometer Corp., succeeding J. G. Stone, who resigned to become president of the Liberty Accessories Corp. of St. Louis.

Lone Star Truck Buys Site—The Lone Star Truck & Tractor Association has purchased 18 acres of land at San Antonio, Tex., as a site for a plant for the manufacture of motor trucks, tractors and trailers. The factory will consist of five units and will give employment to about 400 men in the beginning. This number will be increased as the plant is enlarged. The company is operating a temporary plant of small capacity at Dallas.

Des Moines Takes War Steps—Des Moines, Iowa, dealers, garagemen and repair men are preparing to meet to the fullest extent the request for conservation of materials, time and labor. All houses will be closed daily at 6 o'clock and not opened Sundays except for storage. All minor repair work which can be done by owners will be refused. A cash basis for all repair work, parts and supplies, including tires, tubes, gasoline and oils, will be put into effect at once.

Steps Into Her Husband's Demonstrating Shoes—Mrs. Frank Auten, Bloomington, Ill., has succeeded her husband as demonstrator and instructor of drivers for the Wemple Truck & Tractor Co. of that city, Auten having been called to war. She has been successful in interesting many farmers in the advantages of trucks and has proved to them that the wife or daughter can operate one. Mrs. Auten also represents that the average hauling between the farm and city, using horses, consumes about forty-five days per annum, thus leaving practically ten months for farm work. A truck will do the same work as three teams, saving in operation, due to the high price of feed, while it leaves

eleven months for farm work, requiring but one month for hauling. Mrs. Auten has handled a truck in the rural districts, hauling road materials.

Motor Appliance Acquires New Device—The Motors Appliance Co., East Moline, Ill., has acquired the exclusive control and patent rights of the Maco recordometer, a device which makes a permanent record of the speed of the machine to which it is attached. It also has a locking system by which ignition is shut off to limit speed of the car to any desired maximum. The machine is designed particularly for commercial car use.

Borg & Beck Lease Branch Plant—The Borg & Beck Co., Moline, Ill., has opened a branch plant at Galesburg to take care of a contract for clutches. It was impossible to get enough help in Moline and Galesburg was found to have the largest number of idle men, due to the reduction in the fuel supply of several local industries. The building leased in Galesburg has 33,000 sq. ft. of floor space. The branch plant will be opened July 15.

Something New in Motor Parades—The Century Boat Club, St. Louis, Mo., has announced an unusual motor car parade to replace their annual driving contest. Silver cups have been donated for the event and will be presented by Governor Frederick D. Gardner. The winner will be the driver who has sold the most thrift stamps along the line of march. Each car will be assigned a corner to which it will go after the formal parade. The car will remain there until 5 p. m. when the line will re-form.

Hercules Steel Begins First Unit—The Hercules Steel Casting Co., Milwaukee, Wis., organized several months ago with an authorized capital stock of \$300,000, has concluded arrangements for the erection and equipment of the first unit of its new electric steel foundry plant. It will erect first a brick and steel shop, 80 by 350 ft., to be equipped with a 5-ton electric furnace. The foundry will be ready to pour metal by Sept. 1 or 15. Officers of the company are: President, Joseph Ewens; vice-president, Dr. J. J. McGovern; secretary and treasurer, E. B. Gennrich.

Springfield Women Drive Demonstration Tractors—Demonstration of the Fordson tractor was held at Springfield, Ill., recently, under the auspices of the Jennings Auto Sales Co. Four machines were used, two of them driven by women, Miss Elma Weigs of the Jennings company and Miss Nellie Brown Duff, a newspaper writer. Governor Frank O. Lowden, B. M. Davidson, secretary of the State Board of Agriculture; H. E. Young, secretary Illinois Farmers' Institute, and I. A. Madden, county farm advisor, were among the several thousand who attended the exhibit.

Parts Sent as Baggage—Because of the inability to get all the required material from the East, much of which is sent by express, the Cadillac Motor Car Co., Detroit, has found it advisable to send men from its purchasing department to bring back the desired parts. These men obtain the parts and pack them into trunks and return with them, marking the trunks as baggage. Of course, only small parts, such as hinges, door handles, small parts and accessories can be carried in this way. The method is quite expensive, but was the only way the company could get the needed parts.

New Plant to Make Propellers—A plant for the manufacture of wooden propellers for airplanes, hydroplanes and similar craft has been established in Milwaukee by the United States Aero Propeller Co., Milwaukee, Wis., organized by the same interests owning and operating the Great Lakes Boat Building Corp., manufacturing light, gas-engine driven scouting cruisers and other power boats. W. C. Morehead is president and general mana-

ger of both companies, which jointly occupy the boat works and shops. The new company is working on large Government contracts both for the army and navy.

Corcoran Buys Knabe Piano Plant—The Corcoran Mfg. Co. has purchased the former plant of the Knabe Piano Co. and now will be able to increase its production of radiators.

Kiefer Has Joined the Navy—D. Kiefer, engineer in charge of the ordnance division at the Harroun Motors Corp., Wayne, Mich., has resigned to join the Navy.

Anderson Completes Ambulance Building—The Anderson Electric Car Co. has completed its new building, 300 by 150 ft., which is to be used for the assembling of ambulances for the Government.

Buckeye Buys Cleveland Plant—The Buckeye Brass & Mfg. Co., Cleveland, Ohio, has purchased the plant and part of the tool equipment of the Cleveland Pneumatic Tool Co. The former company was organized eight years ago and has outgrown its present plant.

Tractor Parts Co. Is Formed—The Tractor Parts Co., Cleveland, Ohio, has been incorporated for \$500,000 by S. H. Tolles, John M. Garfield, R. C. Hyatt, Ralph Burroughs and Thomas H. Jones. One of the officials of the company will be J. O. Eaton, treasurer of the Torbensen Axle Co., Cleveland, Ohio.

Government Takes Another Ford Branch—The Government has taken over the Philadelphia branch factory of the Ford Motor Co., and will use it for various purposes. The Washington, Milwaukee, St. Louis and Cambridge branches are also being used by the Government now.

Dine and Cramer Make Changes—J. M. Dine, for the last five years manager of the Omaha branch of the Goodyear Tire & Rubber Co., has been appointed assistant manager of the Chicago branch of the company. C. A. Cramer, of Cedar Rapids, Iowa, succeeds Mr. Dine as manager of the Omaha branch. Both men assume their new duties July 1.

Waukesha Motor Completing Additions—The Waukesha Motor Co., Waukesha, Wis., is completing three shop additions which will be ready for service early in July and provide about 30,000 sq. ft. of additional floor space. The company is executing large contracts with the Government for military truck en-

gines and its commercial truck engine business is the largest known since its inception.

General Motors to Move Department—The General Motors Corp. will move its patent department from Detroit to New York about July 1.

Evans Now in Ordnance Department—G. M. Evans, formerly treasurer of the Menominee Motor Truck Co., Menominee, Mich., is now a captain in the Ordnance Department.

Tire Distributors Give Licenses—E. B. Faris & Co., Winston-Salem, N. C., distributors for the Gillette tire, has a plan whereby a car owner in the state who purchases one or more of its tires will be presented with a state license for his car free of charge.

Waughop With Hurlburt Truck—C. W. Waughop, formerly eastern district manager of the Rainier Motor Truck Corp., New York, has joined the wholesale forces of the Hurlburt Motor Truck Co. of the same city to cover Pennsylvania and Ohio territory.

Brown Now with Cleveland—W. I. Brown, formerly sales manager of the Scripps-Booth Corp., Detroit, has become eastern district sales manager for the Cleveland Tractor Co., with headquarters at the home offices, Cleveland, Ohio.

Barthel of King With Curtiss—T. E. A. Barthel, formerly general manager of the King Motor Car Co., Detroit, has become associated with the Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., and his duties will have to do with the finances of the corporation.

Spooner Resigns from Automotive Show—Ed Spooner, who was appointed chairman of the truck committee of the Automotive and Accessories Exposition, Inc., which is to hold a show on Chicago's municipal pier Sept. 14-21, has resigned. His resignation was due to pressure of other business and was filed shortly after his appointment.

Jorgenson to Make Priming Devices—The Jorgenson Mfg. Co., Waupaca, Wis., is erecting an addition to its plant and will install new automatic screw machine, lathe and other tool equipment to handle large contracts for gas engine priming devices. It is hoped to reach a daily production of 1,000 primers at the close of the year, contingent only upon adequate supplies of steel, brass and copper.



DEALERS RAISE \$2,000 FROM OLD TIRES—The Cincinnati, Ohio, Automobile Dealers' Association erected this Mt. Rubber on Fountain Square from old tires, inner tubes and other rubber accessories in the Red Cross drive. More than \$2,000 was realized in bids on it. One of the unusual contributions was a truck, presented because the owner "could not get off the tires." It brought \$5 in the sale.

From the Four Winds



GEORGE ADE IS HOST TO MOTORISTS—A one-day revival of the interclub series of reliability runs was staged by the Chicago Automobile Club and the Chicago Athletic Association with the aid of George Ade. A big dinner, baseball, golf, and other sports were on the program. George Ade is shown at the right. The cars above are parked at his farm in Indiana at the end of the run



HEAVIER British Tank Arrives—A British tank weighing 42 tons has arrived here and will be used for instruction at American military camps. This is the biggest tank ever transported, being much larger than the Britannia.

New Highway Leads to Shiloh—A highway from St. Louis to Shiloh National Park battlefield through some of the picturesque country and towns of Kentucky, Tennessee—Paris, Paducah, McKenzie, Savannah and other points—is being mapped and built.

North Dakota Adds 1574 Licenses—Increased motor registration in North Dakota for 1918 over 1917 is 1574. The total is 64,568 licenses. In all 13,000 motorcycle licenses have been given out and 770 dealers' licenses.

St. Louis Motorists Treat Orphans—More than 250 motor cars belonging to members of the Automobile Club of St. Louis were placed at the service of the children in the various orphanages in the city one day recently. It is estimated that 2500 children were given a 50-mile ride and a treat of ice cream and cake at the expense of the motor car owners. This is an annual event.

Minneapolis Car Owners Pledge Aid—Seven thousand motor car owners in Minneapolis are pledged to stop on call to transport salvage to the Red Cross shop. Each car carries a Red Cross on a square of tin hammered by shop girls into shape, numbered and punctured so it can be tied to the car radiator. The car owners are all motor deputies of the Red Cross. A service raid of two days recruited the total of 7000.

Where Motor Trucks Vie with Cargadors—The Tampico Auto Sales Co., Tampico, Mexico, has inaugurated a regular motor truck service for the transportation of baggage and the handling of a general transfer business. This new service takes the place of the old cargador system which has been in operation in Mexico from time immemorial. Cargadors are men who carry trunks and other heavy loads upon their backs. They are licensed by the different municipalities throughout the country and have long been one of the picturesque features of Mexican life. Practically all the moving of furniture and household goods generally is done by

these cargadors. It is not unusual for these men to carry pianos and other heavy articles long distances. Whether or not the new motor truck service which has been inaugurated will be able to compete with the cargadors remains to be seen.

Minneapolis to Label Municipal Cars—Minneapolis municipal motor cars are to be labeled "City of Minneapolis" to stop unauthorized driving of the machines. The aldermen are stirred up because it costs \$25,000 a year to keep up forty-seven cars, of which twenty-two are Fords.

Minnesota Million-Dollar Estimate Little Off—Decrease in motorcycle licenses issued and other causes have lowered the predicted registration of enough machines to produce \$1,000,000 revenue by June 1. Secretary of State J. A. Schmahl thus accounts for his wrong guess. However, the totals reached \$947,109.

Kentucky Licenses 67,500 Machines—During the eleven months from July 1, 1917, to June 1, 1918, licenses have been issued by Kentucky for 67,500 machines, with fees amounting to \$390,767, as compared with 22,090 licenses in 1916 and fees of \$181,174. During the five months in 1918 54,000 licenses have been issued.

Filling Stations on War Basis—Filling stations in Minneapolis went on a cash basis July 1. This affects 14,000 customers in the Twin Cities. Between fifty and sixty employees thus will be released for other service. Customers may settle bills monthly by buying coupon books at \$10 each. Eight companies own eighty-four stations in the cities. They observe hours of from 8 a. m. to 8 p. m. week days and will close at 5 p. m. Sundays.

Iowa Road Boosters Meet—Between 5000 and 6000 gathered at Grinnell, Iowa, recently for the annual meeting and picnic of the River-to-River Road Association. In connection with the good roads meeting a county flag day celebration was held so that the meeting was a real patriotic good roads demonstration. Hundreds of motorists from all parts of the state along the River-to-River road drove to Grinnell for the gala day. The road boosters plan to reawaken interest in the road by holding a series of meetings all along

the route. Efforts to enforce the state road patrol law will be made and a general reconsecration to the good roads campaign will be made. At the annual election of officers Verne Russell, of Delaware, president, and E. H. Spaulding, of Grinnell, were re-elected. Other officers named were Ralph Faxon, Des Moines; A. H. Berman, Newton, and Frank Carson, Iowa City, vice-presidents.

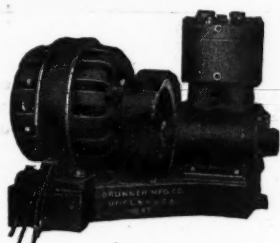
New Testing System for Aviators—A new testing system has been devised which allows the selection of aviators who will not faint in the rarefied atmosphere found at 20,000 ft. It is operated at the flying field on Long Island, N. J., in a special glass room, where the air gradually is pumped out. A dial indicates the height at which corresponding air conditions are obtained. Men who cannot withstand the high altitudes are assigned to work below 15,000 ft. The room is so arranged that if a man faints, oxygen is restored gradually and he revives. In most cases he is unaware that he has fainted.

One Dollar Each Mile for Speeding—Speeders had better go slow in Louisville, Ky., hereafter. The slower they go the less they will be fined. Judge A. Thruston Burgevin in police court has announced a new basis for fining such violators of the law. The rate hereafter will be \$1 per mile per hour. That is, the rate of speed per hour will be the rate of the fine. The new rate went into effect with the presentation of a negro, who was speeding at about 2 o'clock one Saturday afternoon, with the street crowded with race track-bound vehicles, at 38 m. p. h., according to the testimony of Motorcycle Patrolman Ahmann, who pursued him for several blocks. The negro was in a nice-looking touring car. He gave his occupation as a laborer. "Whose car is that?" he was asked. "Mine," he replied. "What do you use it for?" "Oh, jus' foh mah own pursonal use." He was fined \$38 under the new rate.



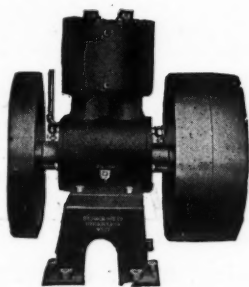
OK
FREE AIR
OK

*"The Garagemans OK"
 is behind the Brunner Sign."*



The Brunner Sign has been consistently demonstrating its wonderful advertising value to the garageman for many years—thousands of garagemen who have been rendering Brunner service, and have been advertising the fact by displaying the Brunner Sign, know that the Brunner Sign is recognized by the Brunnerwise motorist as a sure sign of a compressed air service that always satisfies.

INSTALL A **BRUNNER** AIR COMPRESSOR



Just now in these war times labor is scarce and labor-saving equipment is playing a big part in the economical administration of every business. A Brunner Automatic Air Compressor would save you many hours' time each week because it is a high class thoroughly dependable equipment that delivers the goods—it requires no attention whatever aside from an occasional oiling, and automatically maintains an adequate supply of compressed air continuously—no waiting—no complicated attachments to help motor carry the load, no restriction of the lubrication.



You cannot go wrong with a Brunner Air Compressor because every one sold is backed up with the guarantee of the manufacturer as well as the Brunner jobber that it will do the work for which it is recommended, and that it will be found exactly as represented.



*"The Motorist who is Brunnerwise
 knows Brunner Service Satisfies"*

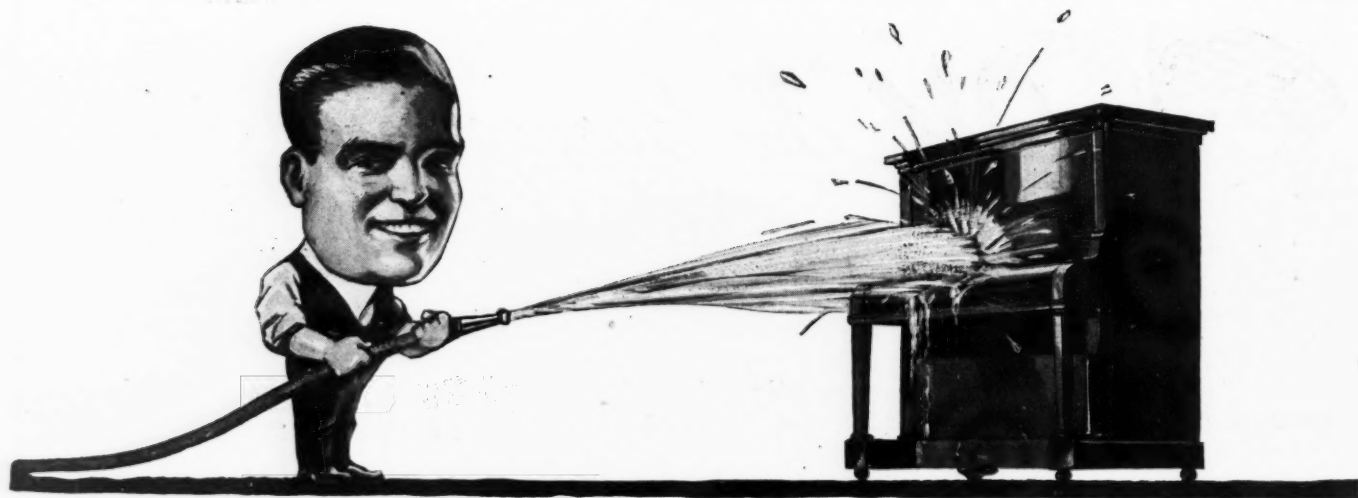


WRITE FOR NO. 15 CATALOGUE AND THE NAME OF THE BRUNNER JOBBER COVERING YOUR TERRITORY—GET ACQUAINTED WITH THE BRUNNER LINE

BRUNNER MANUFACTURING COMPANY

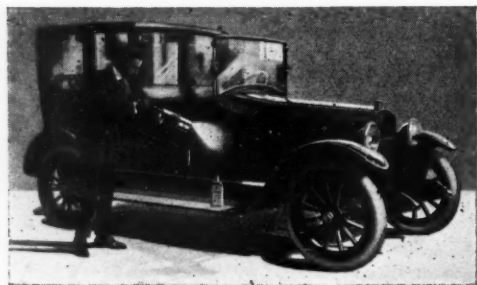
General Office and Plant
 Utica, N. Y.

Cincinnati Branch
 Cincinnati, Ohio



Would You Turn a Hose on Your Piano?

↓
**This Is
 The Right Way
 To Clean
 Your Car**
 ↓



Try It!

The finish of your car is just as costly and delicate as the beautiful polish on your piano. Water dulls and deadens the polish of both. You can't prevent weather dulling your car's polish, but you can keep away from harmful frequent water washing.

AUTO LIQUID VENEER

does easier, quicker, **better** auto cleaning, under ordinary conditions of the car's use than water and soap—and at the same time **polishes** and **protects** the finish preserving the glossy, new look. It removes dust, light mud, road tar **without scratching** or other harm preserving the finish against the ravages of weather.

Compare the average cost of about 5c per cleaning by the AUTO LIQUID VENEER way as against the \$1.00 or \$1.50 for water washing. Compare the fifteen minutes the LIQUID VENEER way to the hour by water washing. Compare the cleanliness of the one to the muss and fuss of the other.

Adopt the LIQUID VENEER way at once. You will get better results for a fraction of the cost—you will make the finish last twice as long—save repainting, and have the satisfaction of a new-looking car continually.

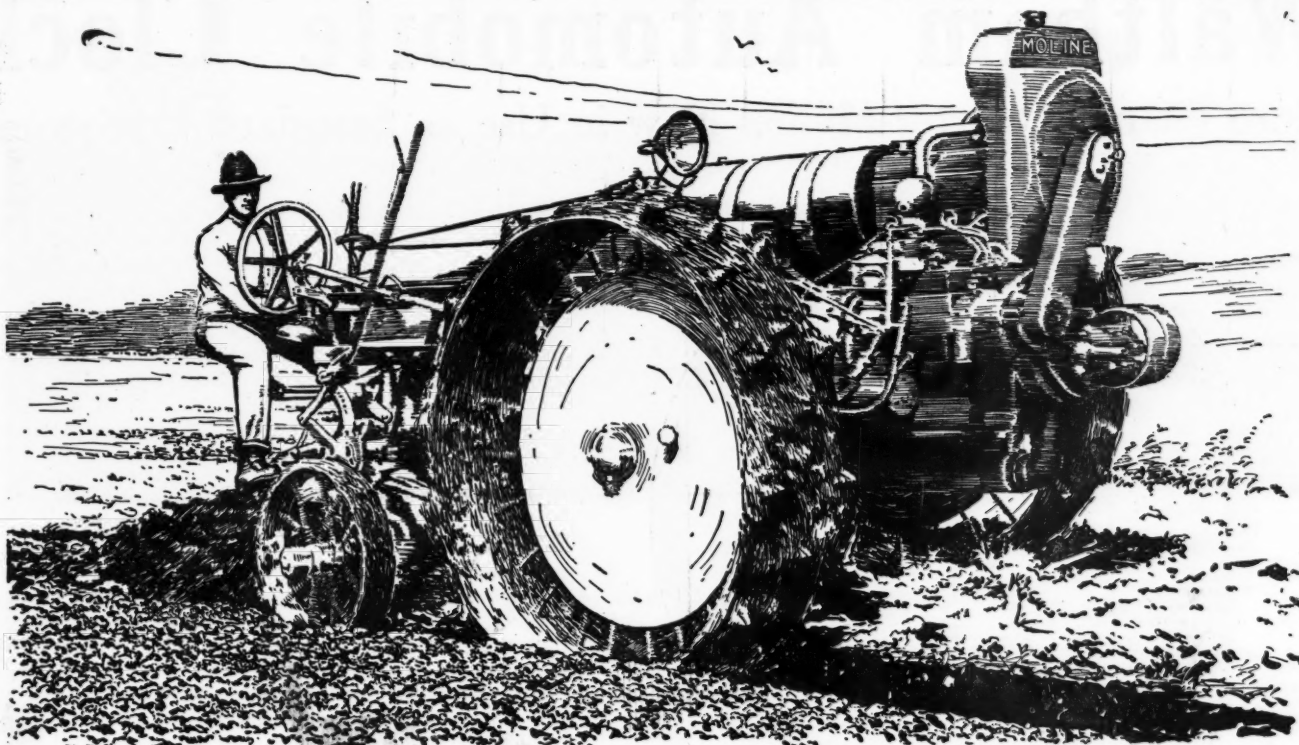
If your dealer cannot supply you, send us \$1.50 for a complete outfit—satisfaction guaranteed or money back.

BUFFALO SPECIALTY COMPANY

395 Ellicott Street

BUFFALO, N. Y.

ONE MAN OPERATES BOTH TRACTOR AND IMPLEMENT



More Speed-More Power-More Work

FARMERS, engineers, dealers, salesmen, in short everyone connected with the tractor industry, are commending the new Moline-Universal Model D. We doubt if any tractor was ever so favorably received by the public as the Moline-Universal Model D.

This is because it is recognized at once that the Moline-Universal two wheel construction, one-man control, and ability to do all farm work together with the improvements such as Remy electrical starting, lighting and ignition, improved four-cylinder perfected overhead-valve engine, complete enclosure of all moving parts, differential lock, etc., make the Moline-Universal Model D the best tractor that money can buy.

It is easy for the practical farmer to see that

the Moline-Universal will do more toward increasing production and relieving the extreme labor shortage than any other tractor.

It is easy for the live dealer to see the wonderful sales possibilities of the Moline-Universal. Our big advertising campaign is now in full swing, with advertisements appearing monthly in 68 national and state farm papers with a circulation of nearly 12,000,000.

The most popular tractor manufactured in the world's largest exclusive tractor factory and the most complete line of tractor implements offers the progressive dealer a real money-making opportunity. If Moline-Universal territory is still unassigned in your locality, it will pay you to get in touch with us at once and receive full particulars.

MOLINE PLOW COMPANY, Moline, Ill.

MOLINE

UNIVERSAL TRACTOR

It Solves The Farm Help Problem

When Writing to Advertisers, Please Mention Motor Age

Waltham Automobile Clock

More Than a Quarter-Million Now in Use as Standard Equipment



Judge the "class" of a car by looking to see if it has a Waltham Automobile Clock

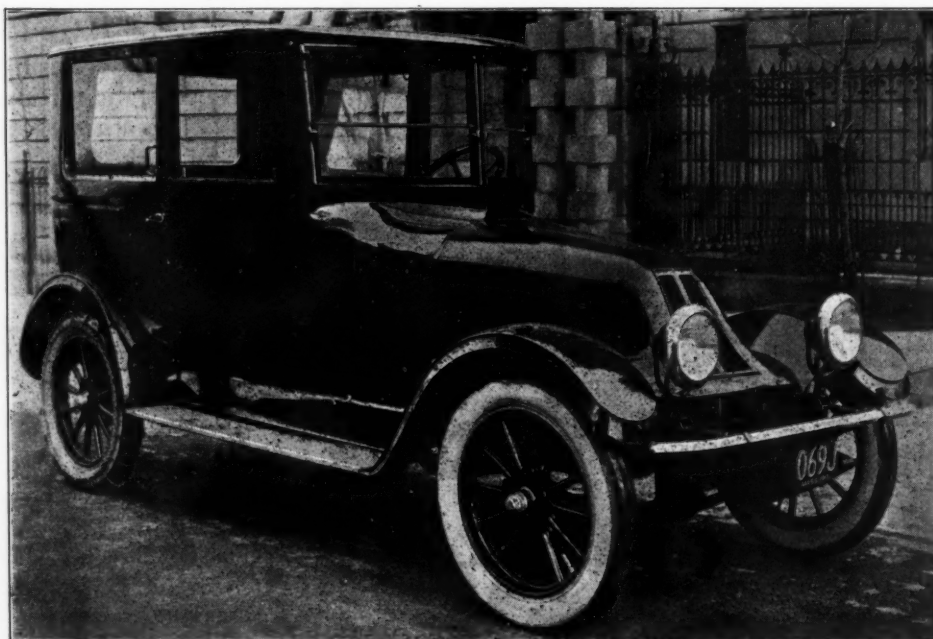
You can tell at a glance that a car is in the "quality class" if it carries a Waltham. Most of the automobiles for which the Waltham Clock serves as equipment cost more than \$2000.

The only automobile clock scientifically built to keep accurate time even though the roads are rough and the weather changeable. Has two main springs, is jeweled, and a red signal on the dial reminds you when winding is needed—once in eight days.

There is no finer tribute to the precision, dependability and appearance of the Waltham Automobile Clock than is found in the fact that the manufacturers of the thirty-one leading cars listed below have selected it in preference to all others.

Cars Equipped With the Waltham Automobile Clock

Anderson 6-40	Fergus	Owen Magnetic
Apperson	Franklin	Packard
Brewster	Haynes	Pierce-Arrow
Cadillac	Hal	Rauch & Lang
Chalmers	Hudson Super-Six	Rolls-Royce
Cole	Jordan	Simplex
Crane	Kissel	Stearns
Cunningham	Locomobile	Studebaker
Detroit-Electric	Marmon	Willys-Overland
Doble	Mercer	Winton
	Murray	



Franklin Sedan Equipped with the Waltham Automobile Clock



Miscellaneous Facts About the New **CARLISLE CORD TIRE**

**THE TIRE THAT REDUCES OPERATING
EXPENSE ON A CAR 25 PER CENT.**

The man who developed the machine which builds the carcass of this tire is F. B. Carlisle.

□ □ □

Mr. Carlisle has spent 17 years in the tire business.

□ □ □

President of the new company is J. S. Bretz, Vice-president of the Bearings Company of America.

The directorate includes J. M. Gilbert, former general manager of the biggest tire and rubber concern in the world.

□ □ □

General Sales Manager of the Company is C. A. Gilbert, former western manager of one of the biggest tire companies.

Western District Manager is C. H. Minto, one of the best known tire men on the Pacific Coast.

□ □ □

Eastern and Central District Managers

are J. H. Ficken and R. M. Hernandez, who have had ten years' experience selling tires in their respective districts.

□ □ □

Among the stockholders are many prominent automobile manufacturers, accessory men, bankers and publishers.

□ □ □

The Carlisle Tire carcass is constructed of cotton rope in unbroken, uncut strands.

235 pounds is the breaking point of a single strand of this rope.

One square inch of the carcass of the new tire stands a breaking test of more than one ton pressure.

□ □ □

Mr. Carlisle's tests clearly show that the Carlisle Cord Tire reduces operating expense on a car 25 per cent.

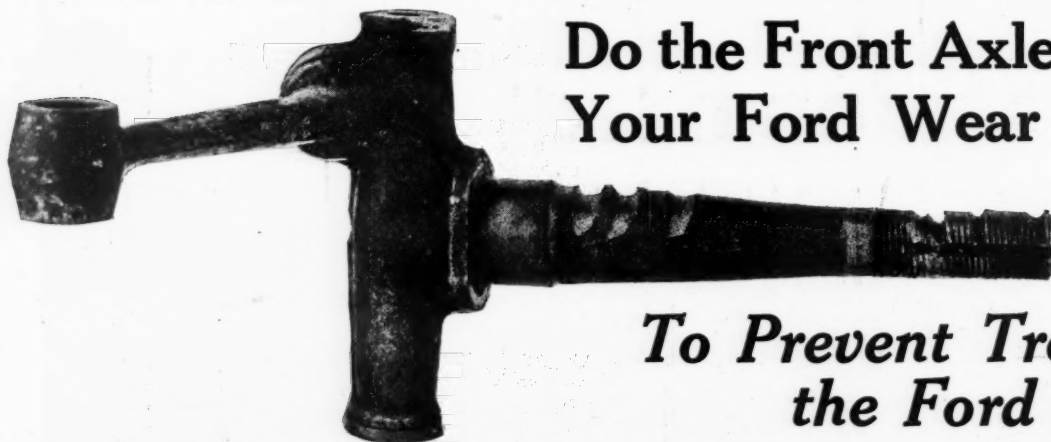
□ □ □

If you don't introduce this astonishing tire in your territory somebody else will. Time lost in sending in your application may cost you the dealership.



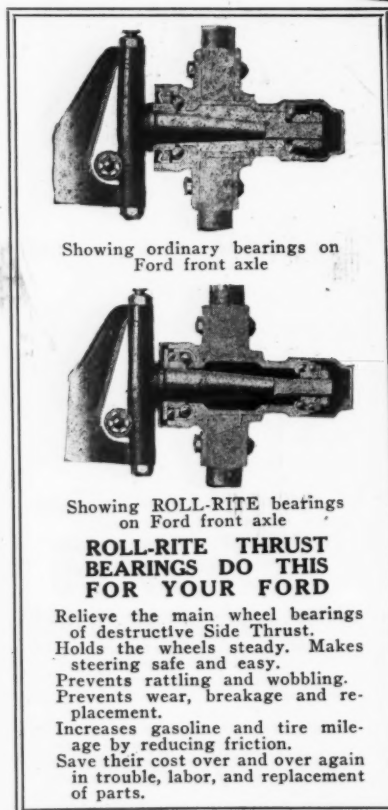
CARLISLE CORD TIRE CO., 250 WEST 54th STREET, NEW YORK CITY. FACTORY, ANDOVER, MASS.

When Writing to Advertisers, Please Mention Motor Age



Do the Front Axle Spindles of Your Ford Wear Like This?

To Prevent Trouble in the Ford Front Axle



Do you have front axle trouble?

Do your front wheels get wobbly and loose-fitting and require frequent adjustment?

Do the bearing "cones" wear and jam the balls out of their retaining cup, permitting the axle housing to ride on the spindle and destroy it?

Study the construction of the Ford front wheel and you will understand why Roll-Rite thrust bearings overcome these troubles entirely.

A cup and cone bearing is capable of withstanding a heavy **rolling** load or pressure for the life of the car, but every time you turn a corner or hit a road bump, a glancing blow, the bearings are subjected to an entirely different and extremely destructive pressure—a **pounding, grinding side thrust** pressure which causes extraordinary friction and strain. It is this side thrust pressure which causes the wear, and the resulting trouble, adjustment and replacement in Ford front wheels.

ROLL-RITE

BALL THRUST BEARINGS

By adding Roll-Rite thrust ball bearings to the wheels you **reinforce** the cup and cone bearings, and relieve them entirely of the destructive side pressure and the cause of wear and trouble.

Roll-Rite bearings are added—they do not take the place of your regular bearings. It is the combination that does it.

They are made of precisely the same materials and built to the same close limits as the finest grade bearings now used in the most expensively built automobiles.

Forestall trouble, annoyance, loss of time, expense and possible accident this year by installing Roll-Rite bearings NOW.

They can be quickly and easily installed and are fully guaranteed.

Order direct or from your nearest jobber. Descriptive literature available, and will be mailed upon request.

We have an exceptionally attractive sales proposition for jobbers and dealers. Write for it.

ROLL-RITE MANUFACTURING CO.

4 Broad Street

Charleston, S. C.



When Writing to Advertisers, Please Mention Motor Age

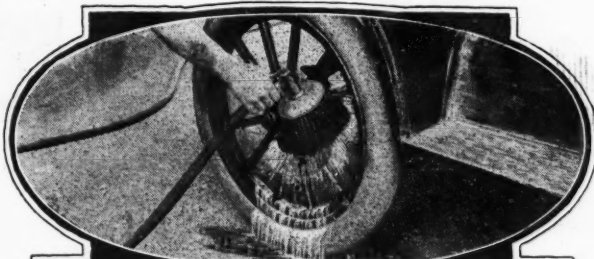
Makes Car Washing Easy

The Water Spray Auto Brush, the greatest improvement in car cleaning appliances in years.

Save Time, Labor and Money

With this Brush a car can be washed in half the time required using buckets and sponges. Spokes and springs and all hard-to-clean places are easily reached by the brush and cleaned in a jiffy. And there is a 75% saving in the cost of the brush compared with that of sponges.

The Water Spray Brush is made of genuine Russian bristles and horse hair, and will outwear sponges costing four times as much. The spray nozzle, hose connection and valve are made of aluminum and are practically indestructible.



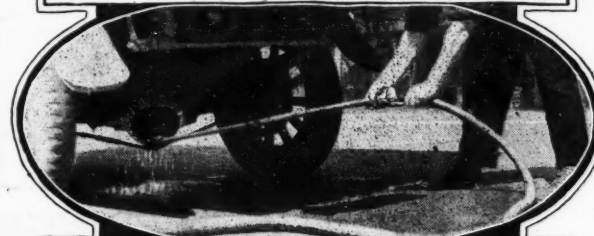
Cleans Quickly and Easily All "Hard to Clean" Places



Will Not Scratch Most Highly Finished Surfaces



Attached to 3-Foot Extension for Washing Truck Tops



Convenient and Time Saving in Cleaning Under Body



Water-spray AUTO BRUSH

Is Convenient — Efficient — Economical

Attached direct to hose, water is sprayed through the bristles of the brush, in any volume desired. Water is controlled by a cut-off valve, operated by pressure of the hand.

Price \$8.00

3 foot aluminum extension brush \$10.00
extra brushes, each..... 3.75

Dealers—Write us for price lists, discounts and full particulars. Big advertising campaign inaugurated and results are sure.

The Water Spray Auto Brush will be sent anywhere on

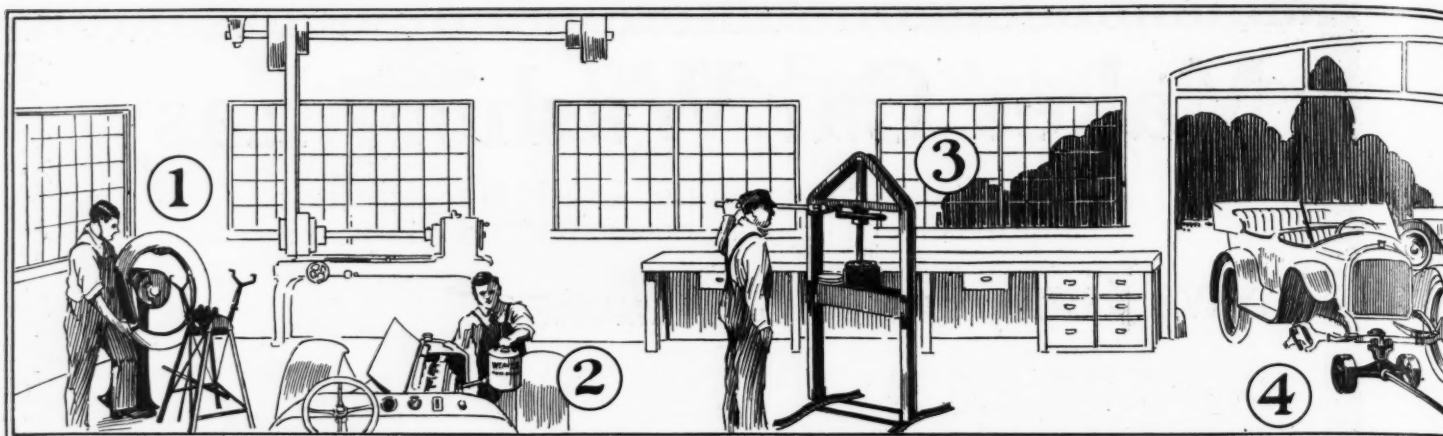
10 Days Trial FREE

SCULLY-JONES & COMPANY
80 E. Jackson Blvd.
CHICAGO

Gentlemen:—Please send illustrated circular and complete particulars regarding the Water Spray Auto Brush, and 10 Day Free Trial Offer.

SCULLY-JONES & CO.
CHICAGO

☐ Auto Owner ☐ Dealer
Make check mark indicating if auto owner or dealer.



WEAVERIZE for SER

Now as never before you must economize on MAN POWER. With fewer, less experienced HELP, you must continue to give your customers the same HIGH-GRADE SERVICE as formerly.

Wherever you can get a machine to do the work of an extra man, or two or three extra men, and do that work BETTER, QUICKER and CHEAPER—it is up to you to GET IT. Otherwise the high cost of doing business may GET YOU.



Send for FREE Catalog of Complete Line

Weaver Labor saving machinery won't quit you, or lay down on the job as incompe-

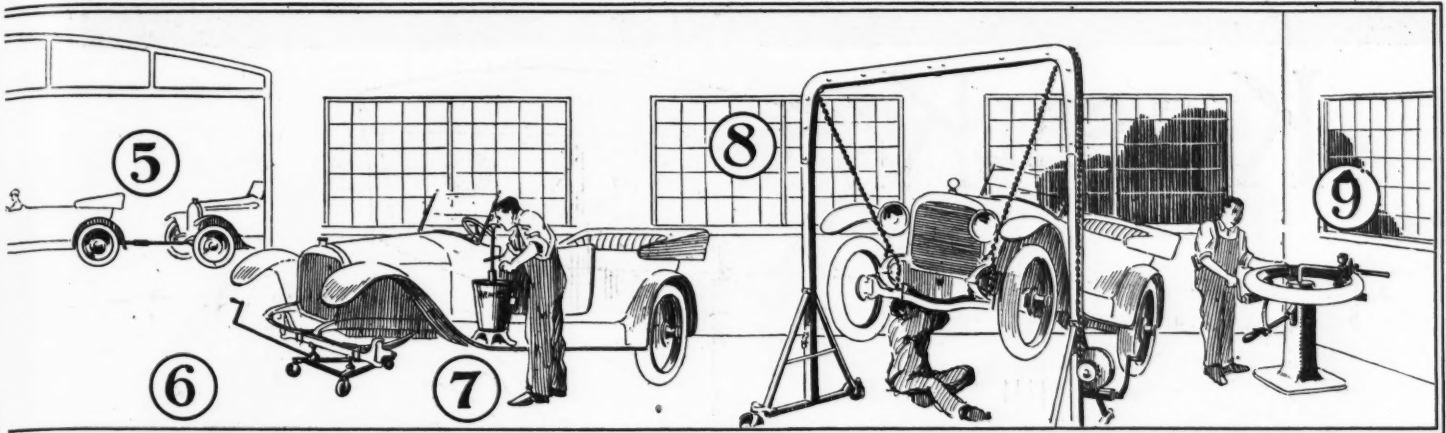
tent help sometimes does. Once installed it works for you forever. It shortly pays for itself in time saving alone. It keeps your men better satisfied by making the hardest jobs the easiest.

Put your shop on a war footing with Weaver Garage Equipment. Give SERVICE and make MONEY.

The different pieces of Weaver Garage Equipment above illustrated are explained in the following descriptions:

1. **WEAVER TIRE SPREADER**—The only efficient means of inspecting the interior of casings, necessary in repairing every puncture, blow-out or other damage to either tube or casing. By means of a quick acting foot lever the casing is spread to its limit, thus exposing the interior for convenient and efficient inspection. Insures better service and increased revenue.
Illustration shows the application of the buffing plate which is part of the regular equipment.
2. **WEAVER AUTO OILER**—Self-Measuring; Convenient; Clean; Economical. Combines in one conveniently handled unit the services of the ordinary funnel, oil can and oil measure.

WEAVER SPRINGFIELD,



YOUR SHOP VICE

The long tubular spout can be turned downward into any position to enable it to be most conveniently inserted into the oil opening of the engine. Oil released by thumb button. Oil from the can is controlled by the convenient thumb button on the grip.

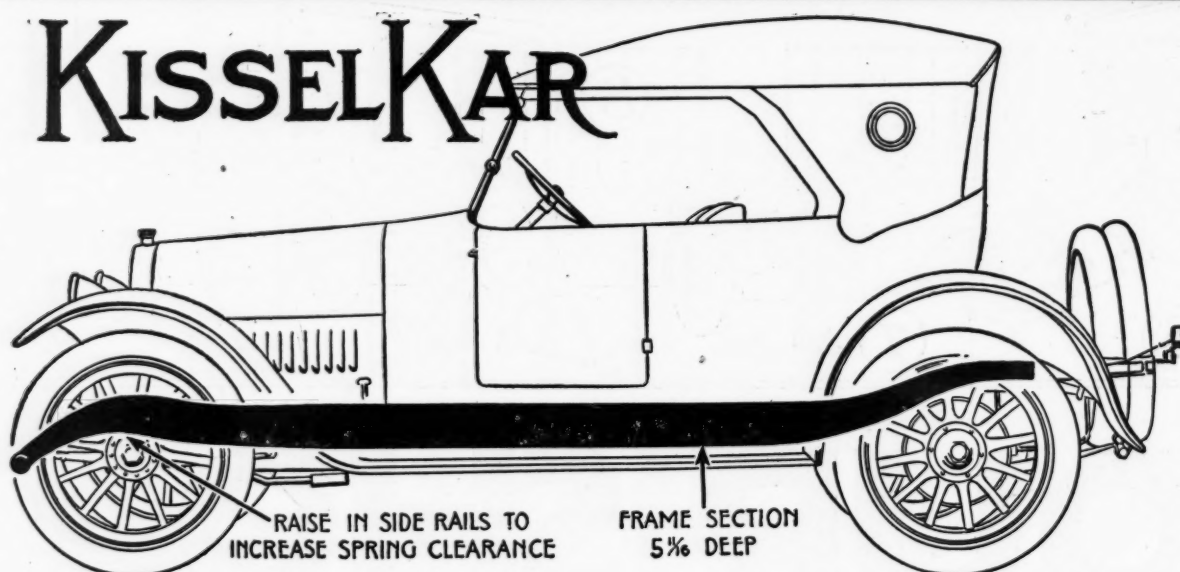
Pressure of the thumb on this button releases the flow of oil and the spout automatically drains. No dripping. No waste.

3. **WEAVER GARAGE PRESS**—Capacity 20 tons. Used to advantage in straightening shafts or axles; pressing bearings or hubs in or out of wheels, forcing gearings or bushings on or off, etc. One-piece frame—quick release feature—ball-bearing wheel—leverage of 1,500 to 1—use as a horizontal press—wide range of application—great depth adjustment are only a few of its many features.
4. **WEAVER AUTO AMBULANCE**—For economically transporting disabled cars to the repair shop. Scientifically designed. Attaches to either front or rear axle.
5. **WEAVER TOWING POLE**—For disabled cars. Improvement over the tow rope, as safeguards against accident, prevents jamming. A spring absorbs all shock. Attaches to front or rear of any car.
6. **WEAVER AUTO TWIN JACKS**—Essential to the most economical and efficient operation of any public or private garage, auto repair shops, paint shops or auto livery. Few turns of crank raises entire end of car. With a Weaver Jack under each axle, one man can handle the heaviest passenger car with ease.
7. **WEAVER VALVELESS BUCKET PUMP**—For soft greases and engine oils. Can be used to empty as well as fill transmission boxes, differential housings, etc. No valves. Self-measuring. Flexible steel hose—practically indestructible.
8. **WEAVER AUTO HOIST**—Takes place of two or three extra men. Occupies small area. Eliminates dangerous pits. Leverage of 500 to 1. Raises heaviest cars with little difficulty. Overstrength chains. Telescoping frame. Single or double suspension. On ball and roller bearing casters. Safety worm hoist.
9. **WEAVER UNIVERSAL TIRE CHANGER**. Handles any rim. Makes money for you on your tire changes. Handles old rusted tires and rims as quickly as new. Eliminates use of hammer and chisel. Will not injure tires or rims. Rims handled by SMOOTH ROLLERS.

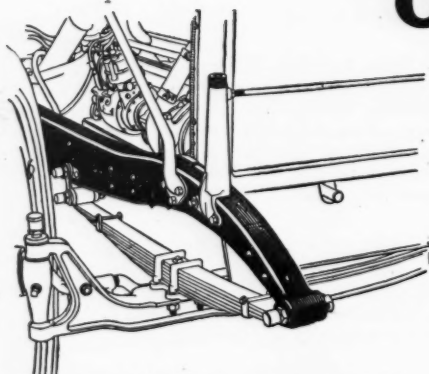
For prices and complete information write for FREE catalog. Start modernizing your garage NOW.

MFG. CO.
ILLINOIS

KISSEL KAR



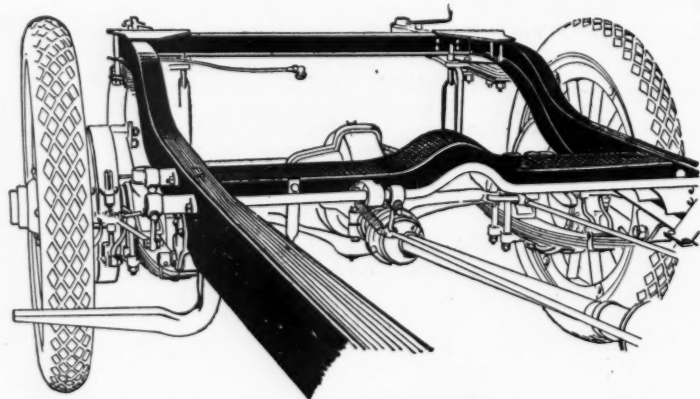
The Gibraltar-Like Strength of the Kissel Frame



Note the kick-up over front wheel that allows body to hang low, still giving necessary clearance for front spring.

IT'S a back-bone worthy of the highest price car—made of cold pressed steel with a tensile strength of 60,000 lbs. to the square inch and elastic limit of 40,000 lbs. to the square inch.

No wonder there is hardly any deflection of frame—no pinching of doors—no possibility of approaching breakage point when under unusual stress or strain.



Extra wide frame in rear, so body actually rests on sill instead of overlapping it. Holds structure of body firmly—eliminating straining on uneven ground and keeping it rigid at all times.

That's the foundation of the Kissel Kar—one of its Hundred Quality Features. The other 99 are just as impressive. Investigate them.

DEALERS—Get in touch with nearest Kissel distributor or write us direct for agency details. Good territory may still be had.

KISSEL MOTOR CAR COMPANY
Hartford, Wis., U. S. A.

**5000
MILES**

THE MIGHTY AMAZON

Isn't This Your Idea of a "Profitable Tire Proposition?"

A tire of such unsurpassable quality that it will outrun any in the field; a tire on which it is easy to make the initial sale because of its many exclusive features.

Exclusive territory in which to sell this super-tire. Protection; so that you may establish a permanent trade without fear of having it taken away by cut-throat competition.

Free advertising, including newspapers, outdoor bulletins and signs, direct mail circularization, window displays, etc.

This is the AMAZON PROPOSITION, a tire that is easy to sell—a tire which, by itself, sells another and another, because it averages far higher mileage than its guarantee of 5,000 miles.

Coöperation in helping you sell that tire in a definite territory; that means but one thing—quick and permanent success.

Amazon dealers are all doing vast volumes of business. Write us to hold your territory open.

THE AMAZON RUBBER COMPANY
AKRON OHIO
NEW YORK BRANCH
218 AMSTERDAM AVE

When Writing to Advertisers, Please Mention Motor Age

This Line Meets Best Every Maker's Specifications; It Turns Over Quickly — It Builds Business and Holds It

Stock the complete AC line and you are prepared to meet the spark plug needs of every motorist. Why experiment with unproved merchandise? Why be swayed by extravagant claims that actual use-service will not justify? Why litter your shelves with a dozen different makes?

Year after year you have watched the leading manufacturers select AC Plugs for standard factory equipment. Glance through the list opposite. There you will recognize practically every fine car made. Mere claims could not influence the builders of these cars. Price could not enter into these transactions. Their reputations demanded that quality alone should be the deciding factor in their choice of spark plugs.

So, year after year, under the most rigid competitive tests in which every spark plug made had the opportunity to qualify, AC's have continued to win the manufacturer's endorsement.

And this belief has spread. Although not quite all car builders use AC's as yet, the great owner-army of this country is becoming an army of AC users. Those whose cars originally bear AC equipment go to the AC dealer with their spark plug needs. And the owners of cars made by those few builders who do not as yet insist on AC's, are installing our

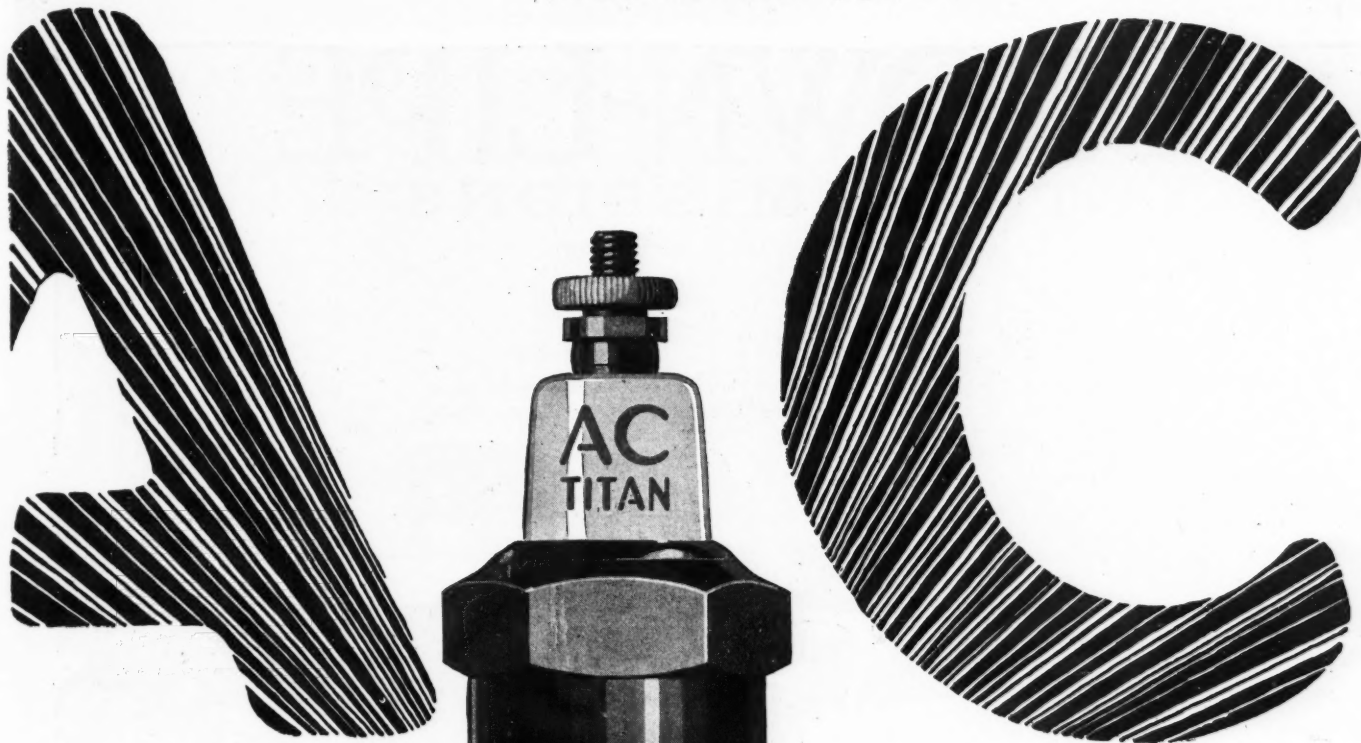
plugs in their motors because they find a marked improvement in service, a greater economy and a bettered performance.

And now a nation-wide advertising campaign is spreading broadcast the message of AC superiority. It is increasing AC sales in every territory.

Grow with success. Stock a complete line of AC Spark Plugs. With them you are prepared to meet every demand. With them you know you are giving your customers the best, for your judgment is backed by the testimony of the country's leading manufacturers.

There are various types of AC Spark Plugs made for every make and style of motor. Owners look for the letters AC when they buy spark plugs. In this trade mark they recognize the infallible guide to highest quality and safe buying. These letters AC are the initials of the originator. They are glazed in the porcelain of every spark plug he manufactures.

Champion Ignition Company, FLINT, *Michigan*



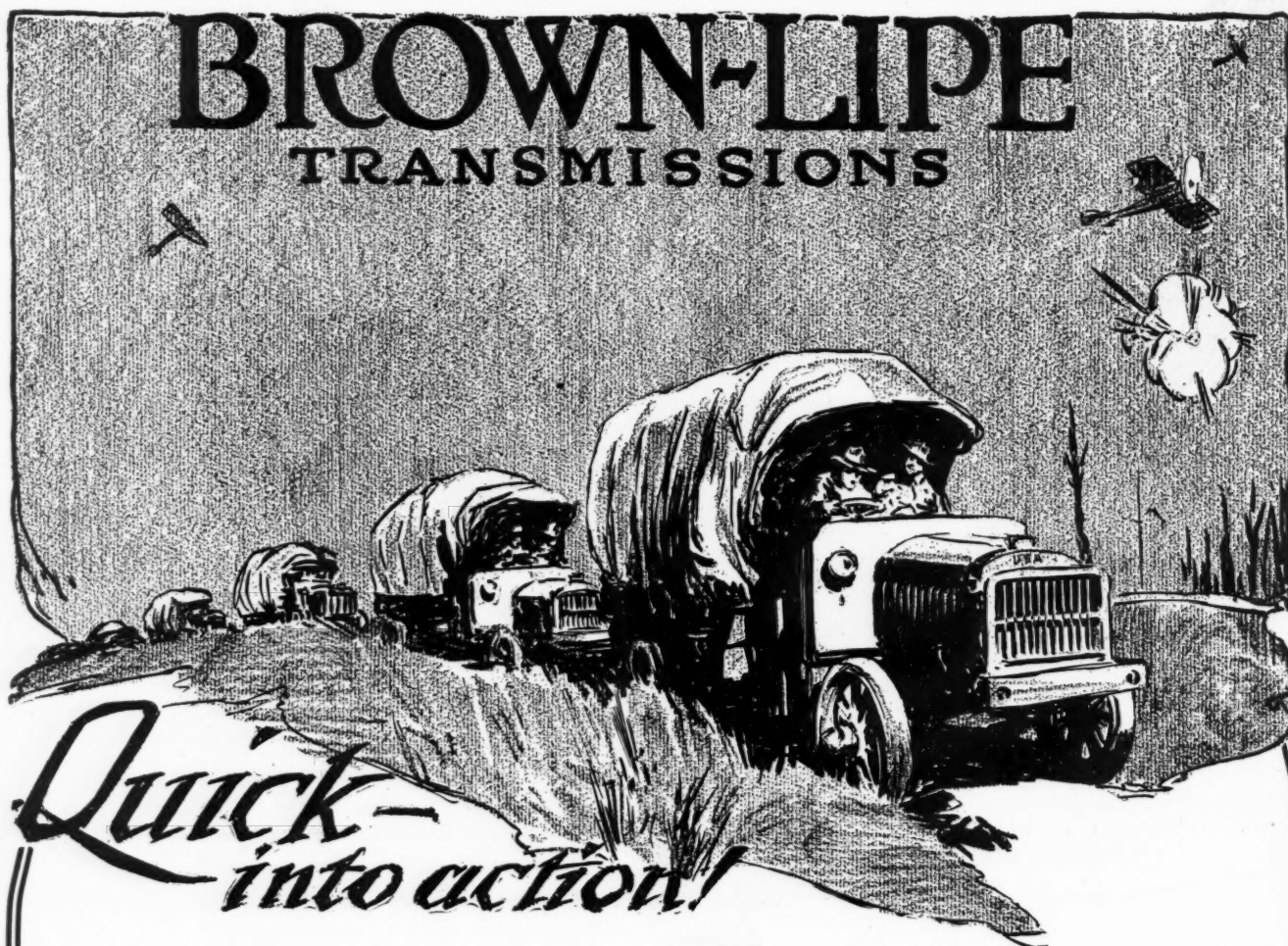
The Standard Spark

Plug of America

All of the well known manufacturers listed below use AC for standard factory equipment

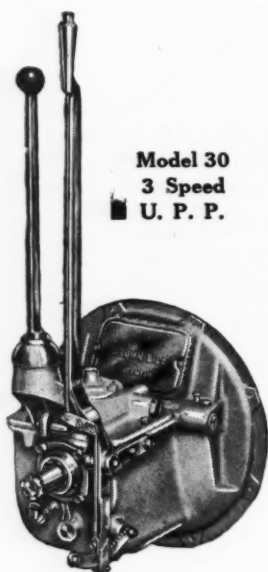
Acme Trucks	G. M. C. Trucks	Paterson
Advance-Rumely	Gramm-Bern-	Peerless
Tractors	stein Trucks	Pierce-Arrow
American-	Hall Trucks	Pilot
La France	Hatfield	Premier
Anderson	Haynes	Reo
Apperson	Hudson	Riker Trucks
Brockway Trucks	Hupmobile	Rock Falls
Buffalo Motors	Jackson	Rutenber Motors
Buick	Jordan	Samson Tractors
Cadillac	Jumbo Trucks	Sandow Trucks
J. I. Case	Kissel Kar	Sanford
Chalmers	La Crosse	Saxon
Chandler	Tractors	Scripps-Booth
Chevrolet	Lexington	Seagrave Fire
Cole	Liberty	Trucks
Continental	Locomobile	Signal Trucks
Motors	Marmon	Singer
Crane-Simplex	Maytag	Smith Motor
Daniels	McFarlan	Wheel
Davis	McLaughlin	Stearns-Knight
Deere Tractors	(Canada)	Stephens
Delco-Light	Menominee	Sterling Motors
Diamond T	Trucks	Sterling Trucks
Trucks	Moline-Knight	Stewart Trucks
Dodge Bros.	Moreland Trucks	Stutz
Dorris	Murray	Titan Trucks
Dort	Nash	United States
Duesenberg	National	Motor Trucks
Motors	Petco Trucks	Wallis Tractors
Federal Trucks	Oakland	Waukesha
Ford & Son	Old Reliable	Motors
Tractors	Trucks	Westcott
F-W-D Trucks	Oldsmobile	White
Gabriel Trucks	Onida Trucks	Wilcox Trux
Genco Light	Packard	Wisconsin
	Paige	Motors

When Writing to Advertisers, Please Mention Motor Age



Motors humming—the sudden shifting of gears—and a quick “pick up” from dead stop to full speed ahead.

To meet such demands, a transmission must be so designed and constructed that it is absolutely dependable. Since the beginning of the industry the name BROWN-LIPE has meant quality and dependability.



Model 30
3 Speed
■ U. P. P.

Particulars to owners, dealers and manufacturers of passenger cars and trucks furnished on request.

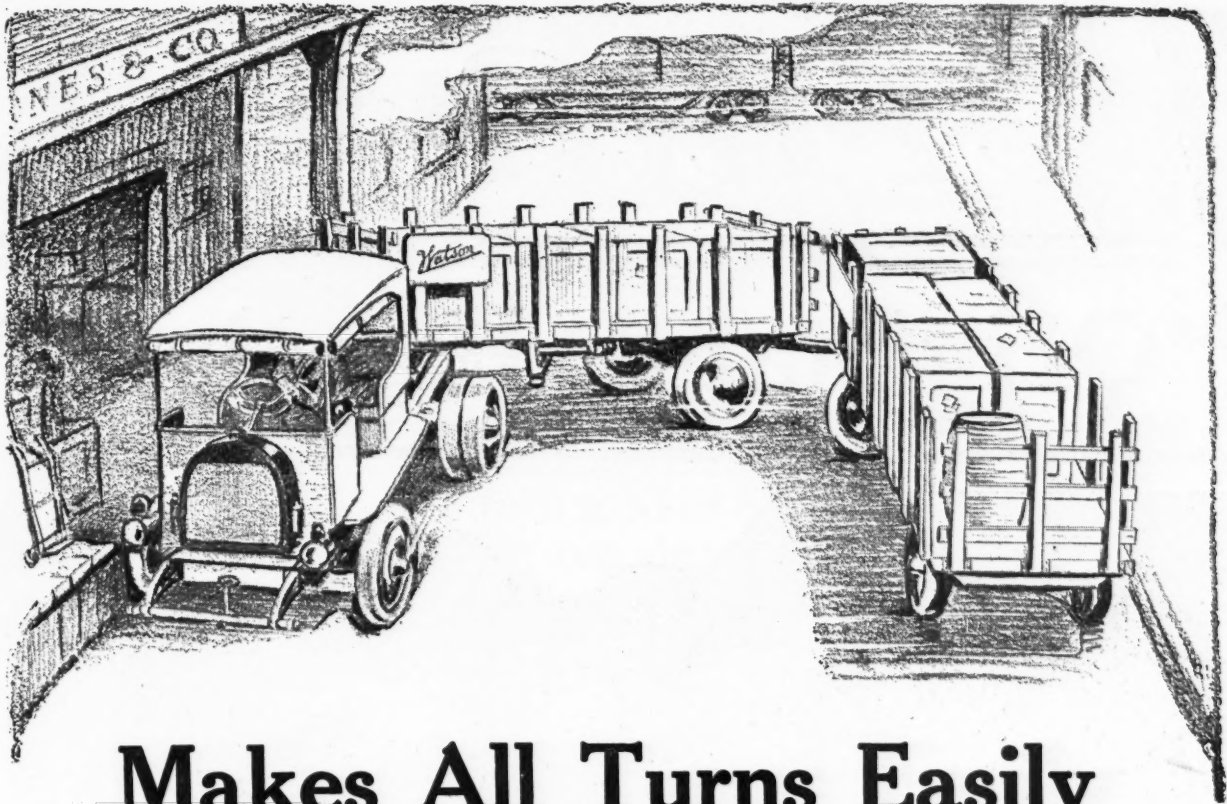
BROWN-LIPE GEAR CO. TRANSMISSIONS

Syracuse,

N. Y.

Representatives:

New York: Thos. J. Wetzel, 29 W. 42d St.
San Francisco: A. H. Coates, 41 Speare St.
Foreign Agent: Benjamin Whittaker, 2 Norfolk St.,
Strand, London, W. C.



Makes All Turns Easily

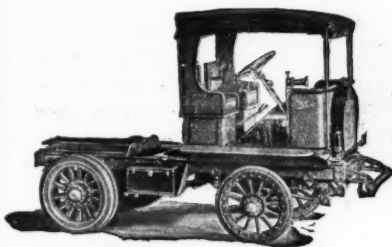
WATSON UNIVERSAL SERVICE TRAILERS

Because of the cut-under type of front wheels, a Watson Trailer will always turn in as short a radius as the truck or tractor hauling it.

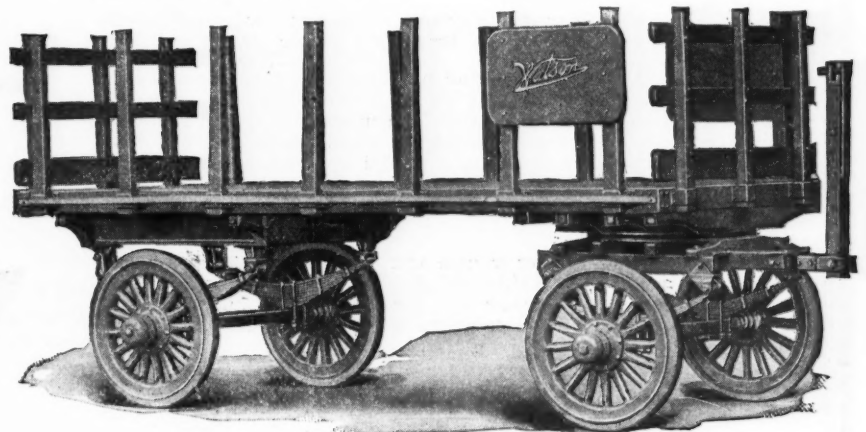
Therefore it is practically as easy to operate a truck or tractor with a Watson Trailer as without it.

100% WATSON TRACTOR

Turns in its own length. A tractor with Watson Trailers attached gets in and out of tight places where trailers would ordinarily be considered impossible.



WATSON WAGON COMPANY
65 West Center Street CANASTOTA, N. Y.



When Writing to Advertisers, Please Mention Motor Age

Perma-Loc

The Original 3-Ply Patch



**To Repair a
Damaged Tube
Economically
and Permanently**

DON'T use a "temporary" patch to repair a punctured or blown-out tube while you race to the nearest garage.

Use a PERMA-LOC self-vulcanizing patch and make a *permanent* repair. Just cut off a strip of PERMA-LOC of a size to fit the hole, apply a bit of PERMA-LOC Cement, press the patch firmly to the tube and you'll have a thoroughly sound repair that will *hold forever*. You can inflate the tube to full pressure, and use it, the minute you've applied the patch. The harder you drive, the more firmly you vulcanize PERMA-LOC to the tube. It will never creep or loosen!

To insure yourself against trouble and delay, stop at your dealer's today and secure a PERMA-LOC kit for your tool box. *There's enough in one strip to repair a 17-inch blowout.* Obtainable in 3 sizes, 50c, \$1.00 and \$1.50, complete with cement. If your dealer can not supply you, write direct.

PERMA-LOC MFG. CO.

310 Board of Trade Building

Factory—Wilkes-Barre, Penna.

Scranton, Penna.

This Sample Size Kit,
enough patching material
and cement to repair 12
average tube punctures,
will be mailed, anywhere,
upon receipt of 24 cents
in stamps to cover the
cost of postage, shipping
and containers.



Dealers

The unusual sales features of PERMA-LOC make it an attractive and profitable seller. You can talk economy and simplicity to good purpose. PERMA-LOC will back up your claims. Write to your jobber or to us for discounts and full details.

STILES

LIBERTY

SIREN

**Over 5,000 sold in St. Louis
in ten days**

This record of sales speaks for itself. And, the sales possibilities are just as big everywhere.

Motor car owners and operators are looking for a trouble-proof signal that will always work. That's why the Stiles Liberty Siren found a ready market.

Easily and quickly installed. No battery connection to cause trouble. Attaches to exhaust manifold, operates by a cord from the steering wheel or dash. And, it always works—get that, *always*. Causes no back pressure on muffler. Fits all cars. Needs no attention—causes no trouble.

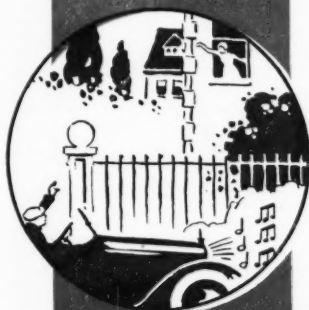
Stiles Liberty Siren comes in a carton complete with simple directions. The signal itself is nickel plated.



A low, polite,
yet far-reach-
ing warning.



A quick, shrill
emergency
blast.



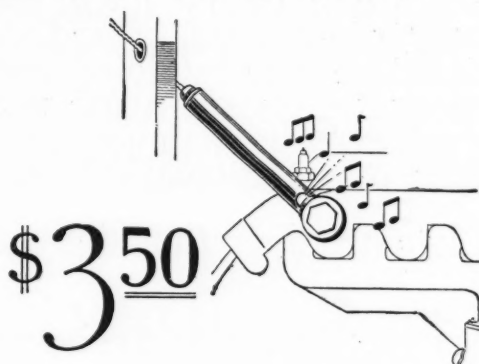
A friendly, in-
offensive hail-
ing signal.



A continuous,
urgent, road-
clearing siren-
signal.



A business-like
truck signal.



Positively Guaranteed

Jobbers and Dealers: Fill out and return coupon immediately and we will forward literature and attractive proposition.

In Canada \$5.00

Liberty Accessories Corporation
1134-36 Chestnut St. St. Louis, U. S. A.

Jobbers and Dealers

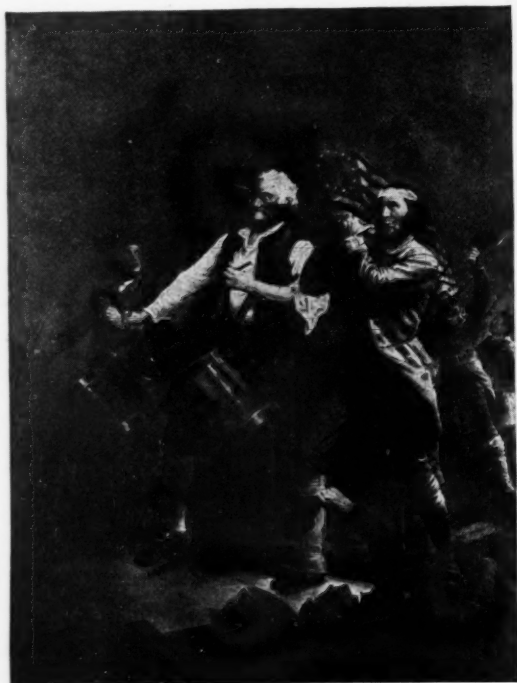
Liberty Accessories Corp.
1134-36 Chestnut Street
St. Louis, U. S. A.

Gentlemen:
Kindly mail me price list and
particulars.

Name.....

Address.....

(If dealer, give Jobber's name and address) MA



JULY 4th-1918

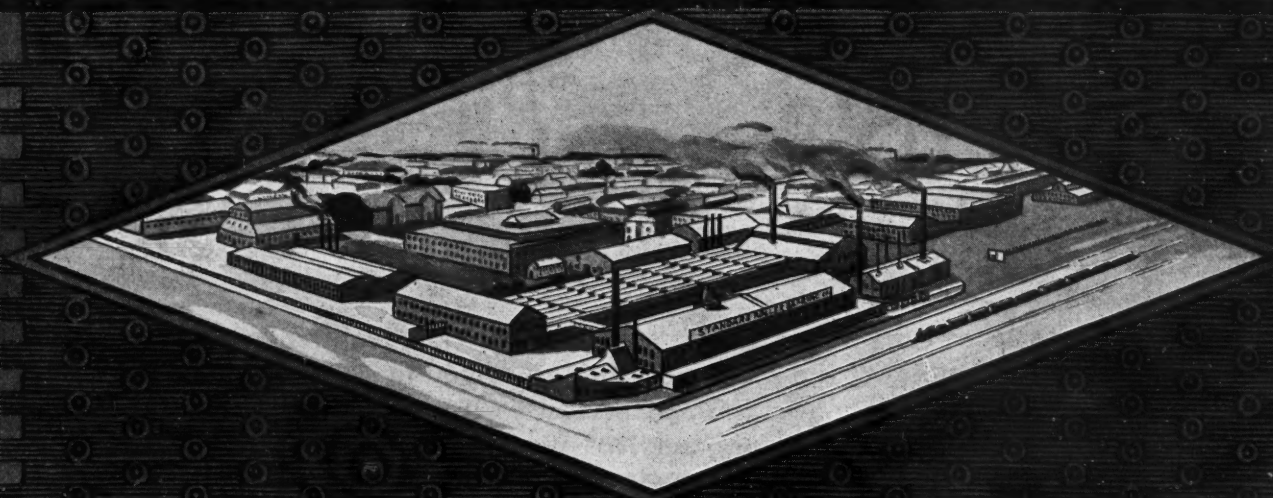
It is significant that one hundred and forty-two years ago our Colonies signed the Declaration of Independence—which declaration would form the basis on which the world at some time would live

Today our allies and ourselves are struggling for the maintenance of the people's independence of the world. We are going through a period which calls upon every man, woman and child to show their love of independence by making sacrifices and by doing everything in their power to assist in the winning of the War which will establish for all times the independence of the people.

It is our prayer that this successful goal may be reached soon.

It is our desire to assist in every way possible towards this ultimate outcome.

JOHNSON COMPANY
Makers of Superfine Instruments
of Carburetion
DETROIT " " MICHIGAN



STANDARD ROLLER BEARING PRODUCTS



**ANNULAR
BALL BEARINGS**
(Single and Double Row)



**STANDARD ALLOY
STEEL BALLS**



**TAPER
ROLLER BEARINGS**
(Special for Fords)



**Improved Type
TAPER
ROLLER BEARINGS**

Rudge-Whitworth **Wire Wheels**

STANDARD ROLLER BEARING CO.
PHILADELPHIA, U. S. A.

Sales Offices:

DETROIT 936 Woodward Avenue
CHICAGO 2206 S. Michigan Avenue
INDIANAPOLIS 822 Hume-Mansur Building

BOSTON 163 Massachusetts Avenue
CLEVELAND 2062 Euclid Avenue
SAN FRANCISCO 41 Spear Street



"Bigger Profits Through Better Tools"

Speed—perfect fitting valves in one-twentieth the time required by old grinding methods. This cuts down the labor cost and gives you more profit on every job. **Accuracy**—angles absolutely accurate and perfectly centered. This insures the kind of a job which makes satisfied customers. **Service**—We keep Sioux Tools always sharp and in good working order—no charge. This complete set of Valve Seat Reamers and Valve Refacing Tool, price \$22.50. Liberal Discount to Dealers.

For Sale by All Live Jobbers

Pat. Feb. 17, 1914. Other Patents Pending.

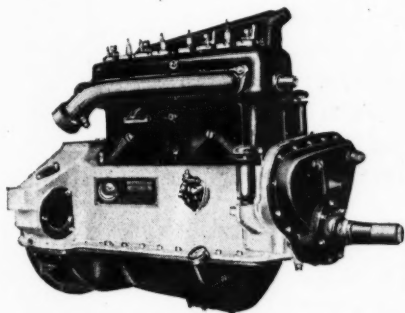
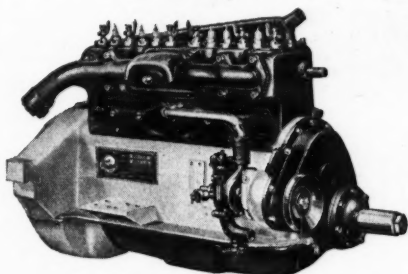


When Writing to Advertisers, Please Mention Motor Age



The Red Seal Assures You 100% Motor Value

America's Standard
Passenger Car Motor.
Look for the Red Seal
Name-plate.



America's Standard
Truck Motor. Look
for the Red Seal
Name-plate.

The Continental Red Seal, shown above, is universally recognized today as the mark of a known quantity in motors.

When you see the Red Seal on a motor, you see a motor that represents the accumulated experience of a generation of motor making—a motor not conceived over-night, but the sure result of the process of evolution.

This motor embodies neither the untried nor the spectacular—it has been *proved* in hundreds of thousands of motor vehicles.

This motor bears not merely the approval of its makers. Upon it over 160 manufacturers of automobiles and trucks stake the success of their product.

This motor you can rely on—not for power alone, not for economy alone, not for endurance alone, but rather for *all* the essential motor qualities.

This motor has stood the one real test of motor worth—the test of Time.

Such is the Continental, and such is the meaning of the Red Seal—the meaning that has made this motor America's Standard.

Look for the Red Seal in the car or truck you buy—it makes you *sure* of 100% motor value.

CONTINENTAL MOTORS CORPORATION

Offices:
Detroit, Michigan

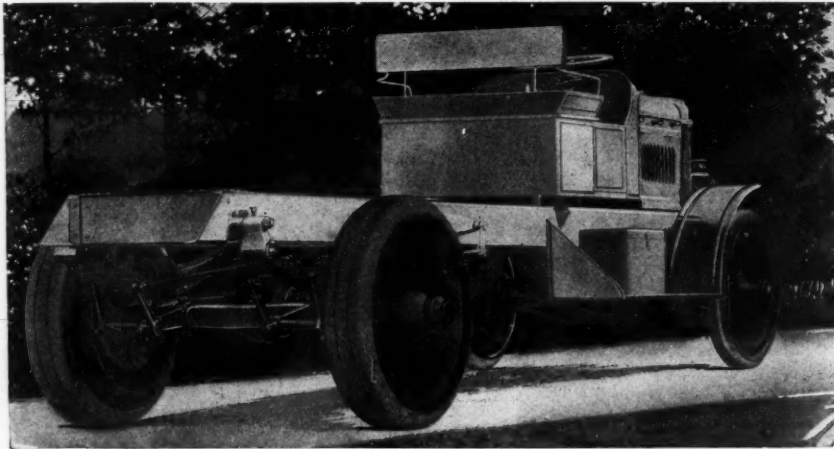
Factories:
Detroit—Muskegon

Largest Exclusive Motor Manufacturers in the World

Continental Motors

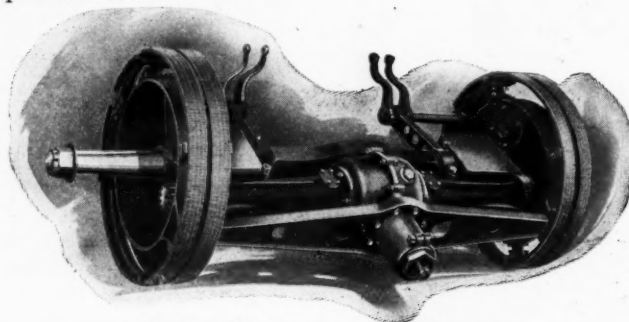
STANDARD POWER FOR AUTOMOBILES AND TRUCKS

When Writing to Advertisers, Please Mention Motor Age



Clark Rear Axle and Wheel Equipment for 5-6 Ton Trucks

Note the sturdy axle and wheel appearance of trucks equipped with Clark Internal Gear Axles and Steel Wheels. This sturdiness and strength is apparent when strenuous truck haulage is accomplished.



Illustrating Axle Model 5 for 5-6 Ton Trucks

Clark rear axles for motor trucks are made in 7 models— $\frac{1}{2}$ ton to 5-6 ton capacity. A model for every type of commercial car and motor truck.

Many discriminating truck makers have adopted Clark truck equipment—others are investigating.

CLARK

Rear Axles

Steel Wheels

Locking Differentials

EQUIPMENT FOR MOTOR TRUCKS

CLARK EQUIPMENT COMPANY
Buchanan - - - Michigan

Send for Informative Booklet and Data

THE CLYDE CARS COMPANY

MANUFACTURERS OF

Clydesdale

CLYDE, OHIO, U.S.A.

July 1, 1918.

To the Motor Truck Dealers of America:

Conditions have never been so favorable from your standpoint for rapid progress in the motor truck business. The railroad situation has brought home to buyers, a keener realization of the value of motor trucks as efficient transportation units with the result that your sales resistance has been reduced to a minimum.

Government co-operation in the establishment of return load bureaus in connection with inter-city hauling and "inside freight" opens up a new field for fleet installations, and increases the efficiency of motor trucks.

Deliveries are of vital importance, for this reason some of the most reputable dealers in the country have joined the Clydesdale family, because of their assurance of prompt shipments of a truck that is second to none from a sales and service standpoint.

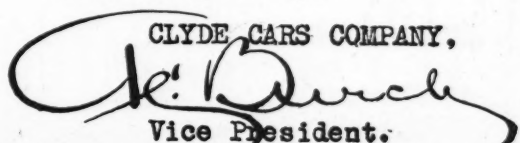
In becoming a Clydesdale representative, you are backed up by a good organization, well financed, whose policies are sound and whose merchandising plans are of such a nature that you, as a dealer, will be quick to appreciate their help to you in your territory.

The truck has made a splendid name for the company and itself, both in this country and abroad. The constructional features include advances in motor truck engineering whose merits have been proven by years of service. With a complete line, from one to five tons, there is a capacity for nearly every haulage requirement.

The Clydesdale line offers an unusual opportunity for building up a stable, profitable business. There are broad gauged, keen business men who can make an advantageous connection for the sale of Clydesdale Trucks, and frankly, there is no time like the present.

Yours very truly,

CLYDE CARS COMPANY,



Vice President.

ACB/DE

DEFIANCE

1½ Ton Trucks



40 Road-Horse-Power

When Writing to Advertisers, Please Mention Motor Age

DEFIANCE

1½ Ton Trucks



The Newest Thing in Trucks —Road-Horse-Power!

Forty *Road-Horse-Power* makes the Defiance Truck easier to sell and to sell *more* of—

Perhaps you have not heard of Defiance *Road-Horse-Power*—It is a new development to lessen delivery costs.

Defiance *Road-Horse-Power* is the ability to use every bit of power developed by the motor and make it work full force at the rear wheels.

Defiance *Road-Horse-Power* means that every gallon of gasoline is made into pulling power.

It is the result of successful engineering and consummate skill that converts full engine-power into driving power on the road.

This means that Defiance *Road-Horse-Power* lessens the delivery, upkeep and investment cost, and—

That is exactly what truck buyers want.

Defiance *Road-Horse-Power* gives it to them—

Defiance trucks are built by the best engineering brains.

—They are made of only first-class materials.

—Composed of the highest class units throughout.

—Backed by a sales-policy that gives an opportunity to make money selling a motor truck that will dominate your field.

Look over these specifications and you will know *why*.

Continental Red Seal Motor. Torbensen front axle and rear, internal drive axle. Grant-Lees Transmission. Arvac Universal Joints. Perfex Radiator. Borg and Beck Clutch.

Get in on this opportunity.

Write to us today for our dealer proposition. \$1795 f. o. b. Defiance.

The Turnbull Motor Truck and Wagon Co.
Defiance, Ohio

40 Road-Horse-Power

Every Owner of a Ford Touring Car A Live Prospect



Heath Duplex

PATENTED MAY 12 1908, DEC 19 1916

Dealers throughout the country have been quick to realize the selling opportunity of the Heath DUPLEX.

With the campaign for national distribution scarcely a month under way, business has exceeded our most optimistic forecast.

These dealers know that over half of the Ford owners in their territory use their touring cars for carrying goods.

They have found out that every Ford owner who makes a regular or even a casual use of his car for business purposes wants this inexpensive, practical device as soon as he sees it.

They have already seen the natural demand for the Heath DUPLEX intensified by the complete campaign of national and local publicity behind it.

Every day sees considerable additional territory closed on the rights to sell the Heath DUPLEX.

*If your territory is still open, we know
you will be glad to learn the details
of our attractive selling agreement.*

McCord Manufacturing Company, Inc.
Division D, Detroit

From a Ford to a Truck in 60 Seconds

Lift off the Ford tonneau. Open up the Heath DUPLEX. You then have a staunch, strong delivery car.

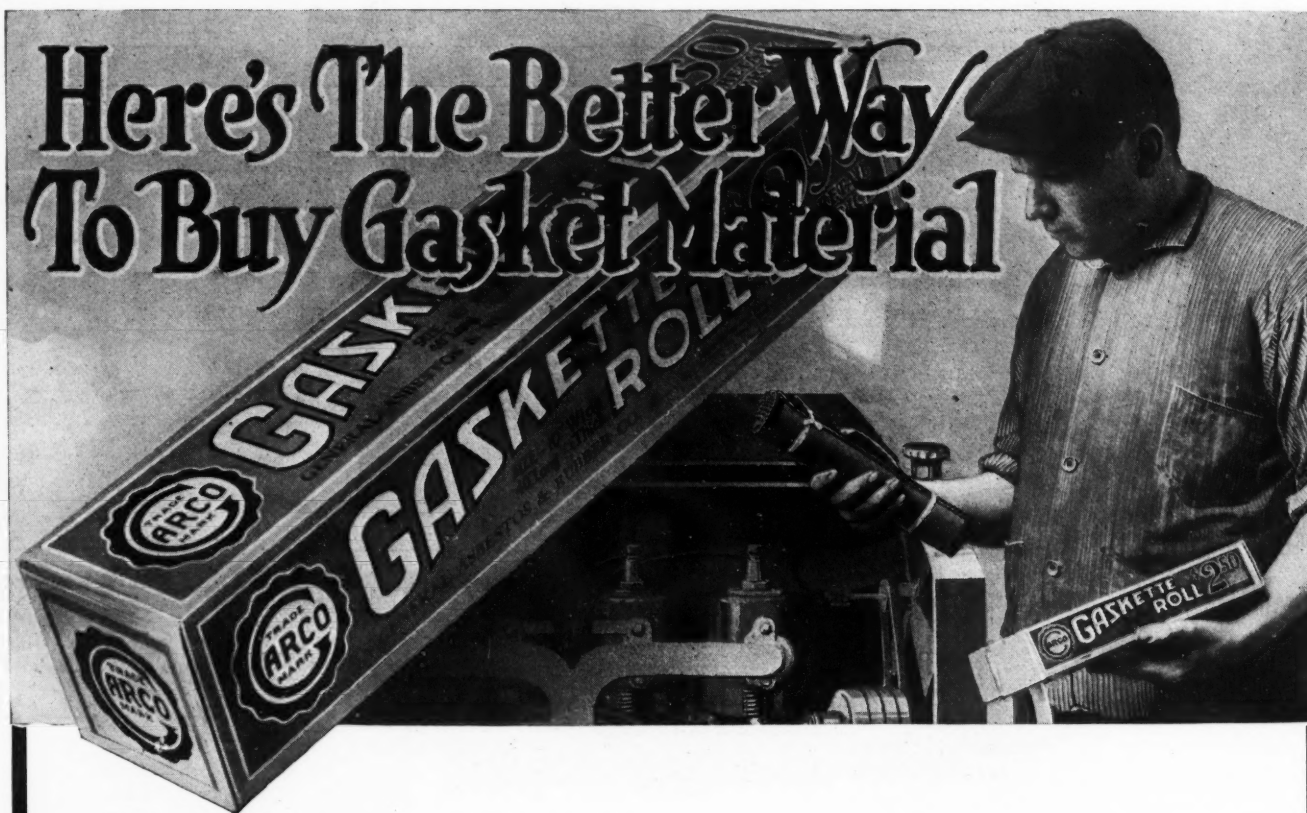
Fold up the Heath DUPLEX, put back the tonneau, and you have the original Ford touring car.

Either change takes one minute. No tools are required. Fits old or new Ford touring cars.

In making the original installation the tonneau is made removable. Thereafter it can be slid on or off, while the front seat remains undisturbed.

The delivery body has a carrying space 4 feet 4½ inches long, 32 inches wide, and 10 inches deep.

When passenger use is required the Heath DUPLEX is folded up without any visible sign of its truck utility. It does not alter the appearance of the passenger car.



Here's The Better Way To Buy Gasket Material

WHETHER your repair work is large or small—whether you buy sheet packing in full roll lots or small cut pieces—you are sure to find constant year-round use for this new



In this durable, convenient carton, fully protected from dust or grit, is one piece of highest-grade *asbestos sheet packing* cut 10 inches wide by 40 inches long. For nine out of ten repair jobs this is just the size you need. Never before have you been able to buy it in convenient, ready-to-use shape like this.

GARCO GASKETTE ROLL is made of the highest-grade, long-fibre asbestos, thoroughly re-enforced by a network of strong, wear-resisting wire. Gaskets made from it can't burn or blow out—are far superior to gaskets made from any form of rubber packing.

GARCO GASKETTE ROLL is guaranteed for use on cylinder heads, intake or exhaust manifolds—in fact, for the highest temperature or pressure that gasket material is ever called upon to meet. It is waterproofed with special GARCO compound, finished red one side, graphite the other.

Buy your packing in the GARCO GASKETTE ROLL carton. Prepare now for the big repair business that is coming this year. Like *Garco Brake Lining* and other high-grade asbestos automobile specialties, it will be sold by the best jobbers in every part of the country.

Send in your order NOW! Don't delay! We can only take care of a limited amount of business, and orders will be filled as they are received. Ask your jobber to supply you, or fill in the coupon here and mail it now. The same high-grade Garco Sheet Packing also sold under GARCO-BESTOS Brand in full rolls of 250 pounds, half rolls of 125 pounds.

GENERAL ASBESTOS & RUBBER CO.

Main Offices and Factories: CHARLESTON, S. C.

Branches and Complete Stock: 58 Warren St., New York; 311 Water St., Pittsburgh; 106 W. Lake St., Chicago

Largest Manufacturers of Asbestos Textile Products in the World

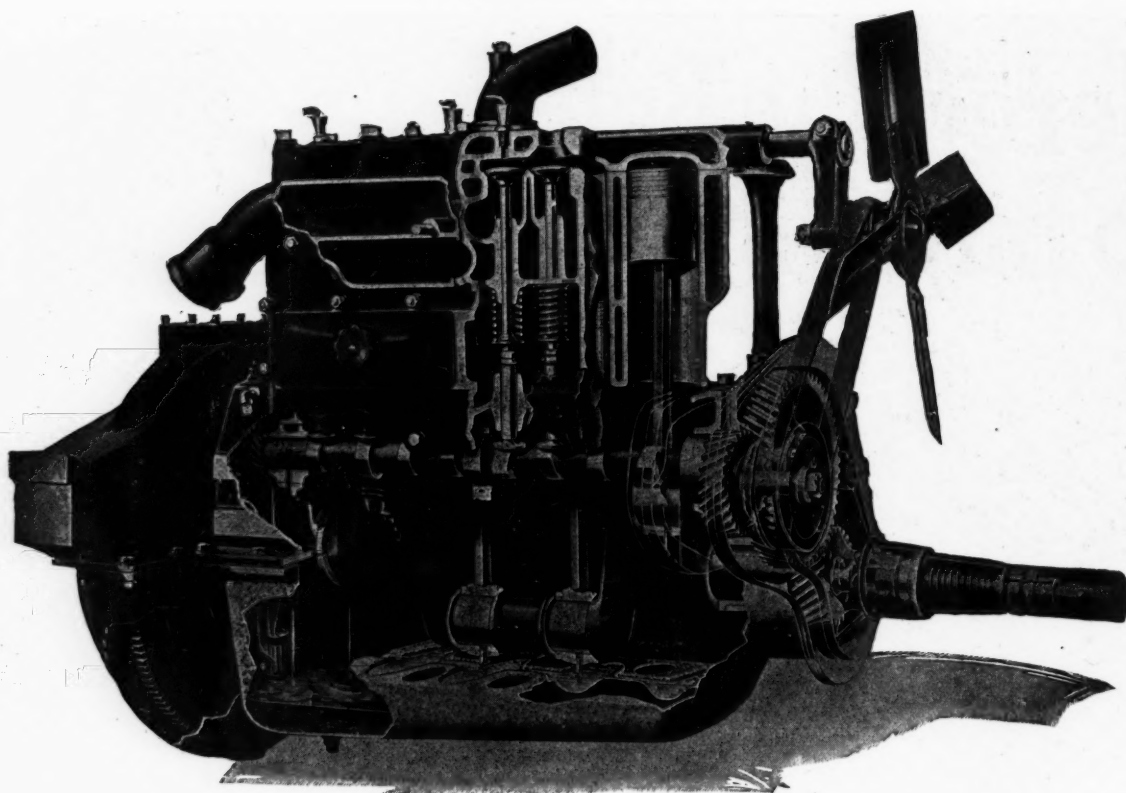
Send
prices
and full
information
on GARCO
GASKETTE
ROLL.

Name

Address

Jobber's Name

When Writing to Advertisers, Please Mention Motor Age



TREMENDOUS POWER

The SPILLMAN "4" weighs more than other fours. Its *camshaft* is nearly as heavy as the *crankshaft* of some fours. This added weight gives it solidity, steadiness, freedom from vibration, allowing the development of much greater power and speed while retaining in full its flexible, smooth-running efficiency.

It has developed as high as 48 Brake-Horsepower.

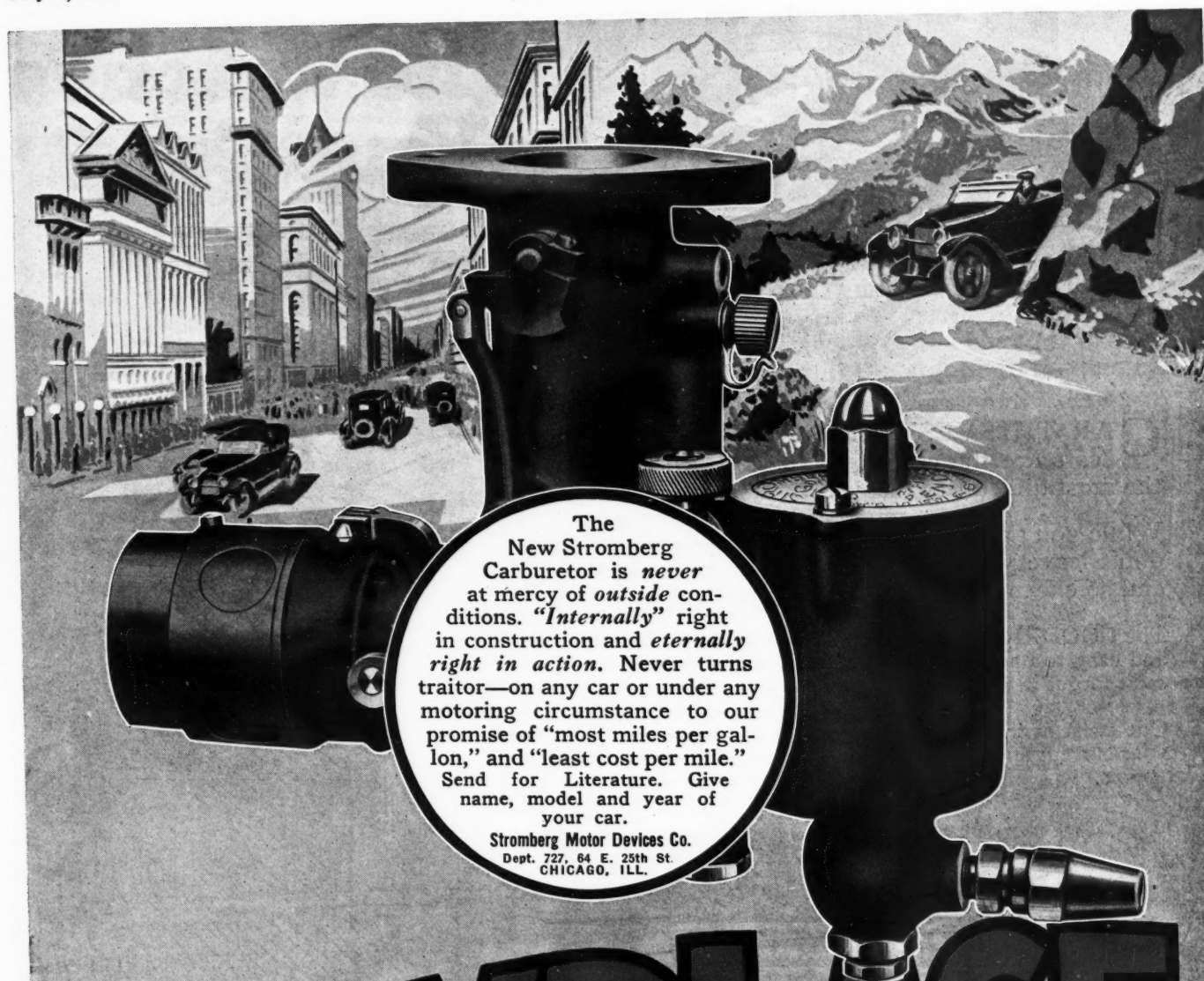
*For light commercial trucks— $\frac{3}{4}$ -ton, 1-ton
 $1\frac{1}{2}$ -ton capacity—the SPILLMAN "4"
is without a rival.*

HERSCHELL-SPILLMAN COMPANY
NORTH TONAWANDA NEW YORK

SPILLMAN 4

3 $\frac{1}{4}$ X 5 — 4 CYL

When Writing to Advertisers, Please Mention Motor Age



The
New Stromberg
Carburetor is *never*
at mercy of *outside* con-
ditions. "*Internally*" right
in construction and *eternally*
right in action. Never turns
traitor—on any car or under any
motoring circumstance to our
promise of "most miles per gal-
lon," and "least cost per mile."
Send for Literature. Give
name, model and year of
your car.

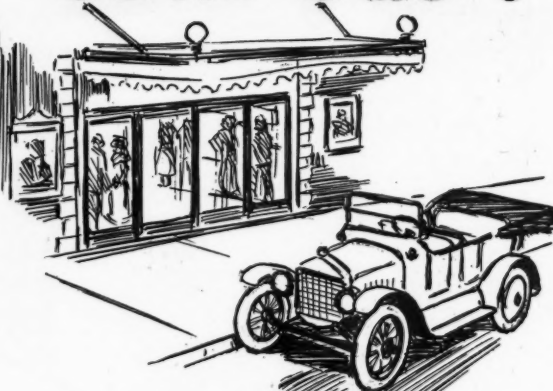
Stromberg Motor Devices Co.
Dept. 727, 64 E. 25th St.
CHICAGO, ILL.

ANYPLACE
ANY PAGE
ANY CAR
A DEEP CUT IN GAS COSTS

New STROMBERG Does it!
CARBURETOR



Who Watches Your Car?



CAR THIEVES ARE ACTIVE—and Ford cars are the easiest of all cars to steal and the most difficult to recover.

While you are at playhouse, restaurant, or office, don't leave your car unprotected. It is so easy and so cheap to get adequate protection for it.

The GOODRICH Lockswitch is thief-proof—it is simple and easy to operate—it is right at your hand where you can't forget it.

One twist of the fingers does the whole thing—turns off your current and locks your car.

Goodrich LOCK SWITCH

for FORDS

When you turn the key, a steel shutter is drawn over the screwheads, preventing removal by means of a screwdriver. The strong, compact construction offers no opening for "jimmy" or crowbar. Special ductile metal, cannot be split, broken, cracked or pried loose. Yale Lock, unpickable.

A secret grounding device concealed within the lock itself makes it impossible for the thief to rewire the coil back of of dash and thereby start the motor.

Dealers: This Switchlock for Fords, and the Goodrich Steering Column Lock, for all makes of cars, are the best selling accessories you can handle. Write at once for liberal terms.

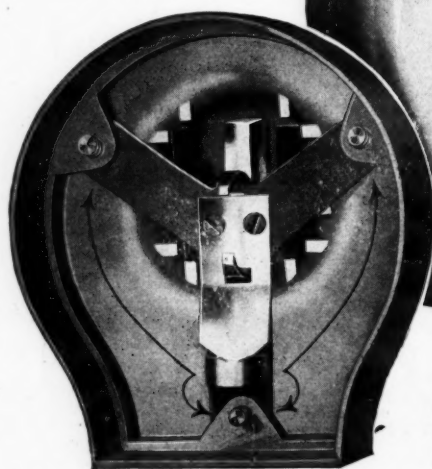
Goodrich-Lenhart Mfg. Co.

419 Widener Bldg.

PHILADELPHIA

PA.

Factory: Hamburg, Pa.



List Price
\$3.50
In Canada \$4.50

The GOODRICH Lock Switch is approved by the Underwriters' Laboratories. This means a 15% reduction in your theft insurance.

When Writing to Advertisers, Please Mention Motor Age

ANNOUNCING

The DART BLUE "J" FARM TRACTOR



THE DART BLUE "J" Tractor is a distinct departure from conventional tractor construction but *does not embody one experimental principle*. Every feature of design and construction has been proved successful after years of use in the automotive industry.

Two features of this tractor are of tremendous importance:

The transmission gearing is so arranged that the tractor is in direct drive at plow speed—one shift of gears from neutral to direct drive.

The rear construction is a combination worm drive and bull wheel gear. This gives a gear reduction of 50 to 1, but the reduction is *divided* between the worm and the bull gear. The advantage is obvious.

A Tractor Backed by Dart Success

The Dart Blue "J" Tractor is backed by the reputation and prestige of the Dart Truck and Tractor organization. The engineer in charge of design has been a tractor engineer for years.

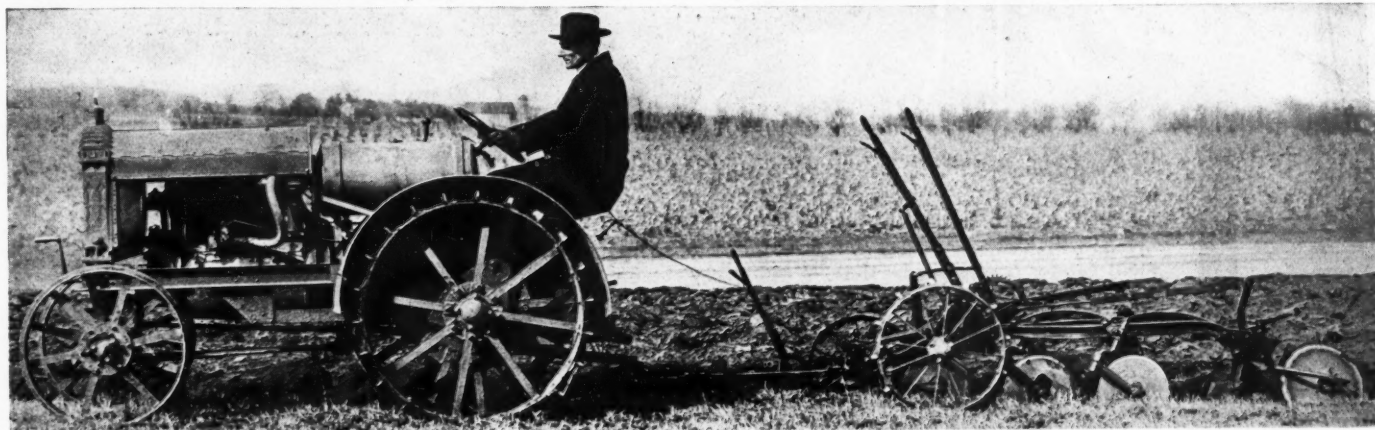
This tractor represents standard construction throughout. There is nothing new or experimental *but a new application of tried and proved principles*.

We are going ahead with all possible speed in perfecting our selling organization. We want dealers in every county who will be within an automobile ride of every tractor they sell. But we want only dealers who can handle this proposition in the right way.

A wire or letter will bring our proposition in detail. There is no doubt about the tractor—it only remains for us to find the kind of dealers that will make up the *logical* selling organization for us.

WIRE OR WRITE AT ONCE

Dart Truck & Tractor Corporation
WATERLOO, IOWA



When Writing to Advertisers, Please Mention Motor Age

WALKER BADGER AUTOMOBILE JACKS



PERFECT SERVICE
Even in Hub Deep Mud

Any motorist who has been compelled to change tires in ditch or mud, will appreciate the Foot Lift feature of the Walker-Badger Jack.

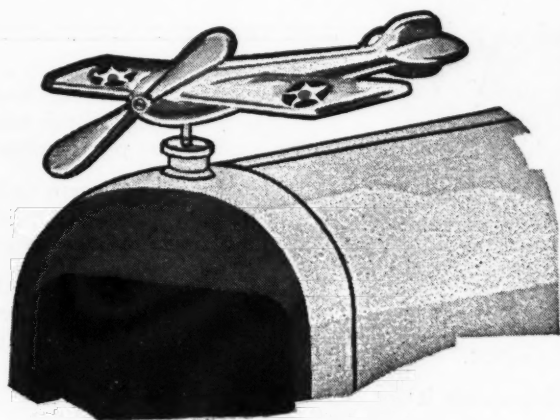
Any motorist who is aware of this mighty improvement—and doesn't *buy* a Badger Jack—will sooner or later wish that he *had*. Lowers itself to within 3 in. of ground. Guarantees quick application to any axle, spring or hub—at any height.

This outward appearance of convenience and thoughtfulness in manufacture is a true measure of "inward" quality that gives the best of operation even under the worst of conditions.

Catalog listing entire Badger Line—A Jack for Every Job—upon request.

WALKER MFG. CO.
26 Hamilton St., Racine, Wis.

SHOW YOUR PATRIOTISM!



GET in line with the spirit of these war times. Equip your car with a Liberty Plane and add a progressive, patriotic touch to your automobile. Let your car reflect your patriotic thoughts and actions. There will be no doubt about where you stand if you have on your radiator cap a

LIBERTY PLANE

PRICE

\$1

The Liberty Plane is an ornament of distinct grace and beauty—something that will put your automobile in perfect harmony with the spirit of today. The Liberty Plane will be a pleasing ornament on the finest car ever built.

The patriotic impression that is conveyed, along with the grace and beauty of its design, combine to make the Liberty Plane the one appropriate radiator ornament of the day.

Keep Abreast of the Times

The Liberty Plane suggests at first glance the spirit of a nation-wide movement—speed—motion—progressiveness—action. It identifies the owner of a car with the modern spirit—adds a touch that is at once distinctive and pleasing.

The slightest breeze starts the fan whirling. The plane is an exact, miniature duplicate of an airplane, reflecting skill and careful workmanship in its construction. It is cast in aluminum, highly polished and carrying the flying emblem beautifully enameled on each wing in red, white and blue.

Once you have attached the Liberty Plane to your radiator cap, you would not exchange it for any ornament that you have ever seen.

The extremely attractive price leaves no doubt that the Liberty Plane is the radiator ornament that will please you most. Write to us at once before you forget, and receive the beautiful Liberty Plane by return mail.

Dealers Attention: You will realize at once the unprecedented popularity with which the Liberty Plane will meet. It will positively sell on sight. The progressive nature of your business will be established and your profits will show a gratifying increase if you add the Liberty Plane to your line. Get in touch with us for our complete dealer proposition.



DEFENDER AUTO LOCK CO.

5th Floor Marquette Building,

Detroit, Michigan

The Monotony of Unusual Performance



TO DUPLEX 4-Wheel Drive Trucks, the unusual is the commonplace! Breaking records has become a matter of course.

To us, Duplex performance is nothing to wonder at; it is expected—planned, and predetermined. This is why we rarely cite definite cases of Duplex achievement, such as the following:

Between Edgewater and Paterson, N. J., is the famous—or infamous—Fort Lee hill. It's a mile long and has grades up to 17 per cent. Doesn't sound difficult to negotiate?

No! But the bottom abounds in deep chuck holes; the middle is a mass of soft asphalt; the top section is rough cobble stones. As good measure there's a hair pin turn on the last lap.

Still, it's negotiable—for an automobile or a lightly loaded truck. But the Duplex was neither!

At Edgewater they gave the Duplex eight thousand pounds of sugar to

carry—and another six thousand (loaded on a trailer) to haul. All told, the load totaled seven tons. Summarized, the conditions were: A stiff grade; bad road surface; difficult turn where the grade was steepest; seven tons on truck and trailer; new, stiff engine.

The 3½-ton Duplex made it!

Made it in twelve minutes. Made it without difficulty, although in places the soft asphalt was two inches deep.

Then it completed its 50-mile run on a total gasoline consumption of seven gallons, and at a cost of four cents per ton mile.

* * * *

To us this performance is not particularly startling; to us such accomplishment is perfectly natural. But here are quotations from truck users—who keep careful tab on all trucks:

"Seven miles to the gallon with methods.

four tons on truck, and pulling a trailer carrying three tons is indeed a marvelous performance."

"It does not seem possible that any truck . . . could obtain such remarkable mileage."

"In all my records which cover the operation of 1400 different trucks I can find nothing to compare with it."

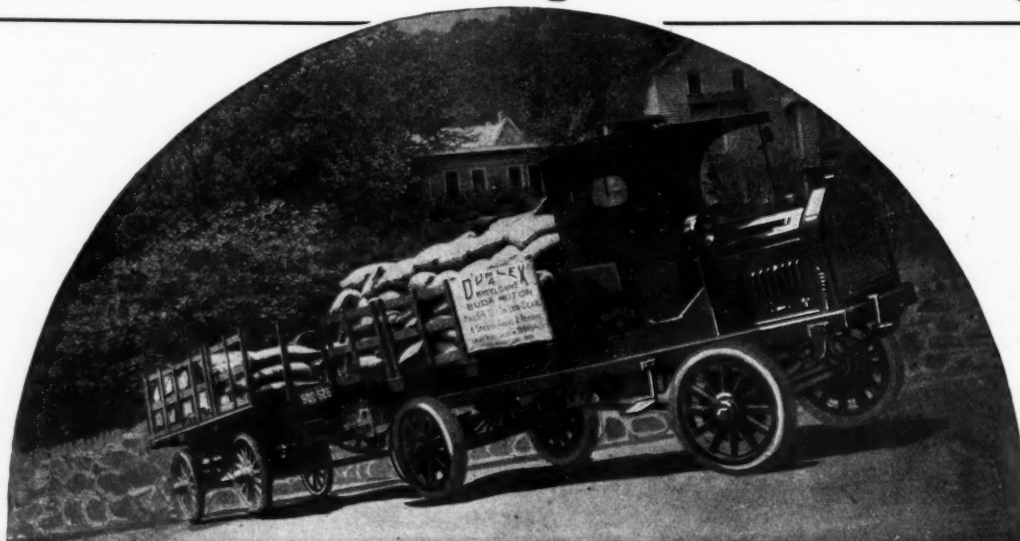
* * * *

The Fort Lee hill performance was unusual as a **motor truck** achievement, and **not** unusual as a Duplex accomplishment, simply because such ability is built into every Duplex truck. Exclusive principles—correct designing—careful construction—and ten years spent in doing it—help us produce a truck that is so dependable.

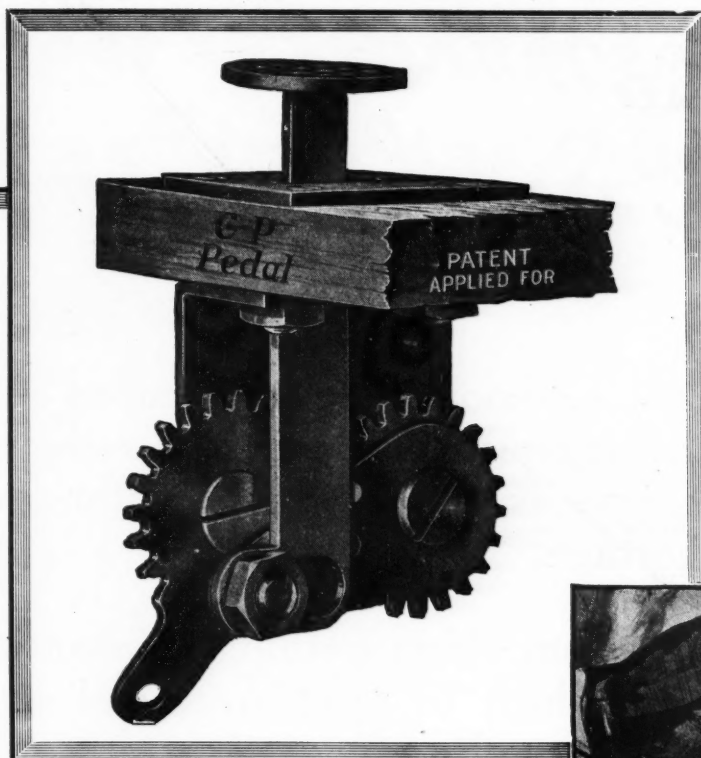
* * * *

With increased production, an opportunity is offered established, aggressive dealers to become Duplex distributors. Write for our dealer proposition and "Duplex Doings," issued in the interest of economical and better transportation

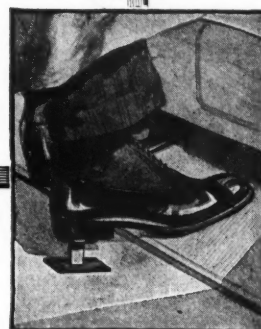
Duplex Truck Co., 2024 Washington Avenue, Lansing, Mich.



When Writing to Advertisers, Please Mention Motor Age



Showing detailed construction
of G-P Pedal



New cut-out pedal—strong and durable

Will easily operate any cut-out spring

EVERY motorist needs a stout, strong dependable pedal to operate his cut-out—one that will last, and yet always work easily and efficiently.

The G-P PEDAL is made entirely of steel. Geared compound leverage makes it exceptionally easy to operate. *There are no springs to wear out and become loose.*

Compounding of leverage and geared parts allows installation in minimum space. The installation requires but one small hole drilled in the floor board. Locking device is on the bottom plate so

the pedal can be fastened to a steel or wood floor board of any thickness without altering its throw. By releasing one screw the G-P PEDAL can be changed to lift or pull in any direction desired.

Here is a pedal that operates any cut-out easily and effectively no matter where the cut-out is located. Will last for the life of the car.

The G-P PEDAL is a quick selling accessory that is bound to bring you profitable returns. For detailed information write direct to us.

We also manufacture the G-P Muffler Cut-Out—it "Tells The Motor's Secrets."

The G-P Muffler Cut-Out Pedal

Sales Department

EDWARD A. CASSIDY CO., Inc.

Madison Ave. & 40th St., New York City

Manufacturer: The G. Piel Co., Long Island City, N. Y.

a waiting market You Can Supply

Few automobile dealers indeed are not feeling the pinch of reduced income because of the motor car shortage.

Optimism offers nothing substantial with which to meet overhead and hold a selling organization, *but Lalley-Light does.*

Furthermore, it presents the timely opportunity for building a business both permanent and profitable, which fits in admirably with the motor car.

The market is ready and waiting. Your business and your immediate profit are there for the taking.

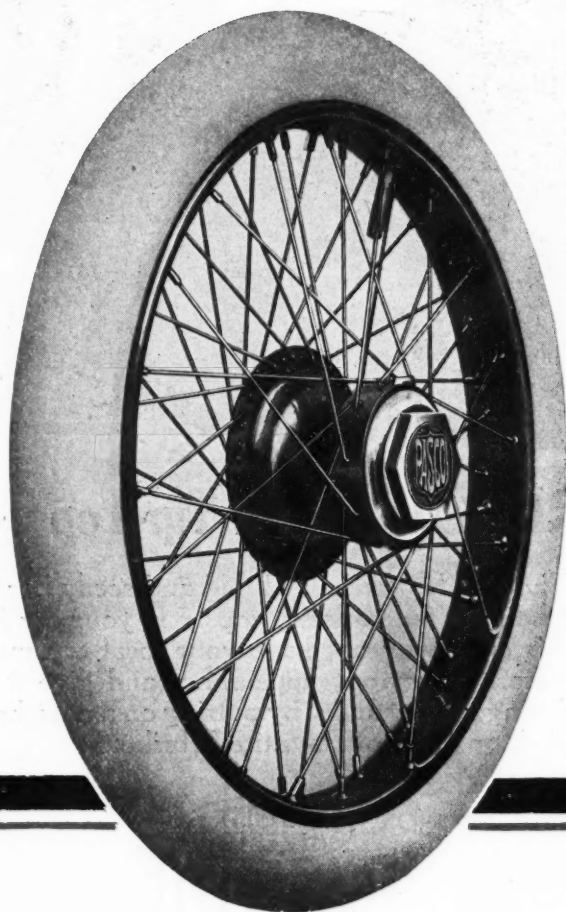
Write at once or wire for details.

Lalley Electro-Lighting Corporation
1821 Mt. Elliott Avenue Detroit, Michigan

LALLEY-LIGHT

"Always runs and runs right"

Strongest Wire Wheel made 5 times as Strong as Wood Wheels



The unparalleled strength and rugged dependability of Pasco Wire Wheels have been proved by actual tests. The 4-spoke-crossing construction of tangent spoke-lacing, peculiar to the Pasco, constitutes a demonstrated protection against wear and breakage.

PASCO WIRE WHEELS

Besides having a superior web (each spoke crossing 4 others), Pasco Wire Wheels possess two other exclusive features, namely an indestructible hub-cap and a safety locking device that locks hub-cap and wheel to the hub, effectually preventing a loose or wobbling wheel.

These special features are not the results of happy chance, but of many years' study and practical experience in the manufacture of Wire Wheels. They are visible

evidence of the thorough competence in Wire Wheel building distinguishing this organization, whose efforts have been exclusively devoted to this business for more than a generation.

You will find Pasco Wheels on practically every make of Airplane now in use. Considering the severe exactions of the Air Service, their pre-eminence in this field is significant.

*DEALERS: A remarkable opportunity for immediate and continued profits.
Write for liberal sales proposition.*

National Wire Wheel Works, Inc.

Geneva, N. Y.

U. S. A



When Writing to Advertisers, Please Mention Motor Age

DU PONT AMERICAN INDUSTRIES



RAYNTITE FABRIKOID—The Tip-Top Top

Thousands of cars look old and seedy because of dingy, faded, leaky tops. If your car is in this class why not have your local top maker restore its snappy appearance and give it enduring serviceability by putting on a new, beautiful top made of Rayntite Fabrikoid.



is made to stand heat, cold, rain and snow without losing its fresh appearance. We specifically guarantee it for one year not to leak, crack nor peel—but it's made to last the life of the car. Why not end your top troubles once and for all with a top backed by a Du Pont guarantee. Check Rayntite in the coupon. Send for free sample and tell us the best top maker in your locality.

Du Pont Fabrikoid Company

World's Largest Manufacturers of Leather Substitutes

WILMINGTON - - - DELAWARE

Works at Newburg, N. Y., and Fairfield, Conn.
Canadian Office and Factory, New Toronto, Ont.

THE DU PONT AMERICAN INDUSTRIES ARE:

E. I. du Pont de Nemours & Co.,	Wilmington, Del.	Explosives
Du Pont Fabrikoid Co.,	Wilmington, Del.	Leather Substitutes
Du Pont Chemical Works, Equitable Bldg.,	N. Y.,	Pyroxylin and Coal Tar Chemicals
The Arlington Works, 725 Broadway, N. Y.,		Ivory Py-ra-lin and Cleanable Collars
Harrison Works, Philadelphia, Pa.,		Paints, Pigments, Acids and Chemicals
Du Pont Dye Works,	Wilmington, Del.	Dyes and Dye Bases

Mark X before subject that interests you and
Mail This Coupon to

E. I. DU PONT DE NEMOURS & CO.
ADVERTISING DIVISION
WILMINGTON M. A. DELAWARE

<input type="checkbox"/> Craftsman Fabrikoid	<input type="checkbox"/> Auto Enamel
<input type="checkbox"/> Motor Fabrikoid	<input type="checkbox"/> Industrial Dynamites
<input type="checkbox"/> Rayntite Top Material	<input type="checkbox"/> Blasting Powder
<input type="checkbox"/> Fairfield Rubber Cloth	<input type="checkbox"/> Farm Explosives
<input type="checkbox"/> Challenge Collars	<input type="checkbox"/> Hunting & Trapshooting
<input type="checkbox"/> Py-ra-lin Rods & Tubes	<input type="checkbox"/> Anesthesia Ether
<input type="checkbox"/> Py-ra-lin Toilet Goods	<input type="checkbox"/> Metal Lacquers
<input type="checkbox"/> Transparent Sheetting	<input type="checkbox"/> Pyralin Enamel
<input type="checkbox"/> Sanitary Wall Finish	<input type="checkbox"/> Refined Fusel Oil
<input type="checkbox"/> Town & Country Paint	<input type="checkbox"/> Commercial Acids
<input type="checkbox"/> Vitrolac Varnish	<input type="checkbox"/> Alums
<input type="checkbox"/> Flowkote Enamel	<input type="checkbox"/> Pigment Bases
<input type="checkbox"/> Antoxide Iron Paint	<input type="checkbox"/> Tar Distillates
<input type="checkbox"/> Bridgeport Finishes	<input type="checkbox"/> Bronze Powder

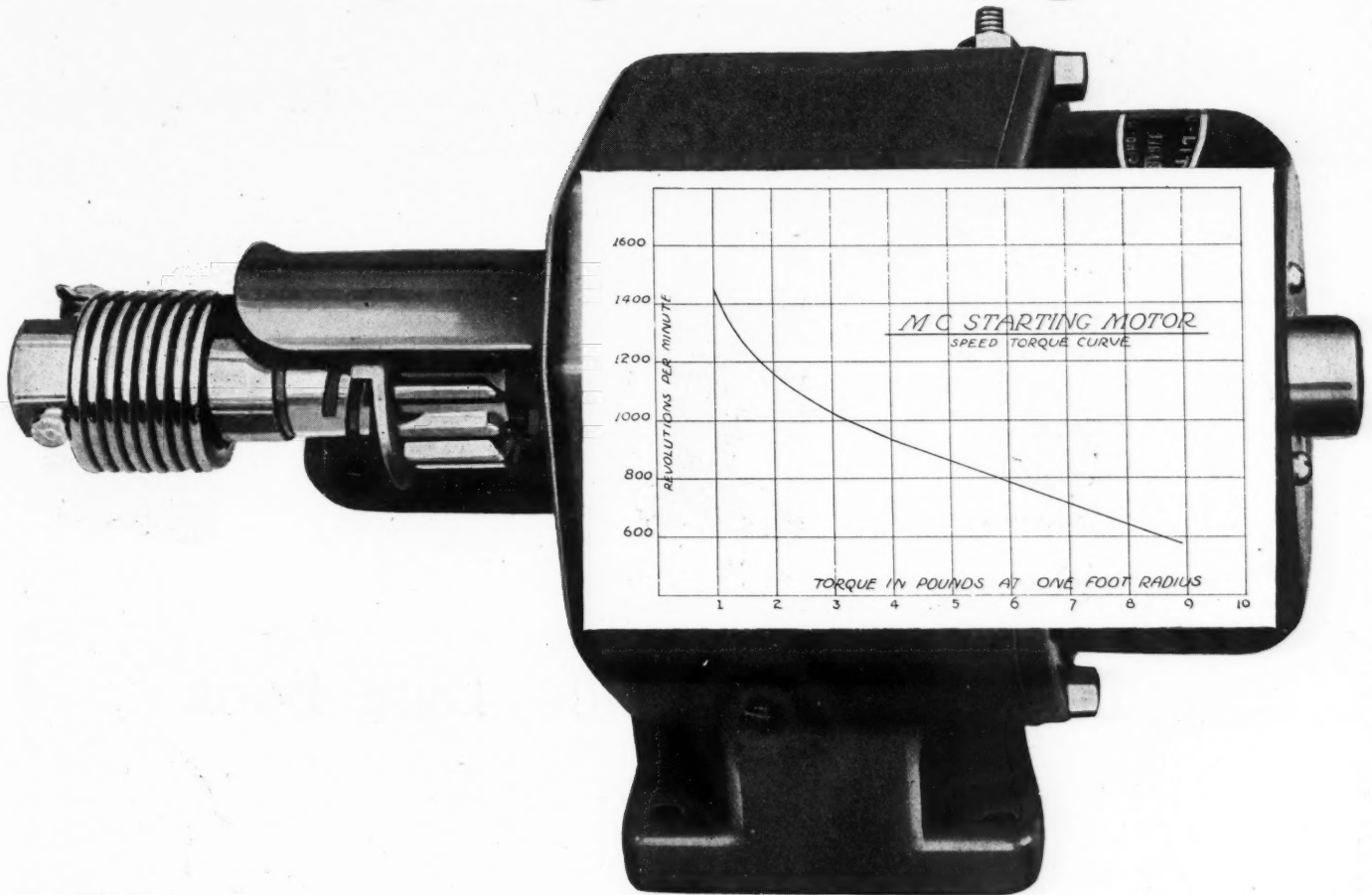
Name
Address
City State
Business

Visit the Du Pont Products Store,
1105 Boardwalk, Atlantic City, N. J.

DU PONT

Auto-Lite

Starting, Lighting & Ignition



Simple—Rugged—Efficient

FOR automotive engineers the above chart, stripped across a photograph of the Auto-Lite M. C. six volt starting motor, is eloquent of this motor's efficiency.

It shows the amount of torque exerted on the engine fly-wheel at one foot radius. For example at 120 revolutions per minute of the automobile's engine the Auto-Lite starting motor has a pulling power of about one and three-quarter pounds with a gear reduction of 10 to 1.

The starting motor is geared to the engine fly-wheel from the well-known Bendix Drive at a gear reduction of from 10 or 15 to 1. This means a powerful torque to break away a stiff engine in cold weather and produce high cranking speeds.

The remarkable success of the Auto-Lite system is due in a large degree to its simple and rugged mechanical design, resulting in long life and dependable operation.

The starting motor is series wound to give a maximum "break-away" torque in high working speeds.

It is weather and oil proof.

This is our one and only product, therefore a highly specialized product.

The demand for it requires our daily output of 1800.

The world's largest builders of cars use Auto-Lite.

Electric Auto-Lite Corporation

Head Office and Factory, Toledo, Ohio

Detroit Sales Office, 1507 Kresge Bldg.

When Writing to Advertisers, Please Mention Motor Age

The selling test of any accessory
The Automobile Blue Book has

Number sold increases every year →

25,000



1911

35,000



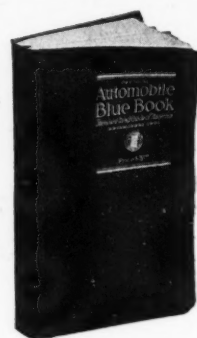
1912

38,000



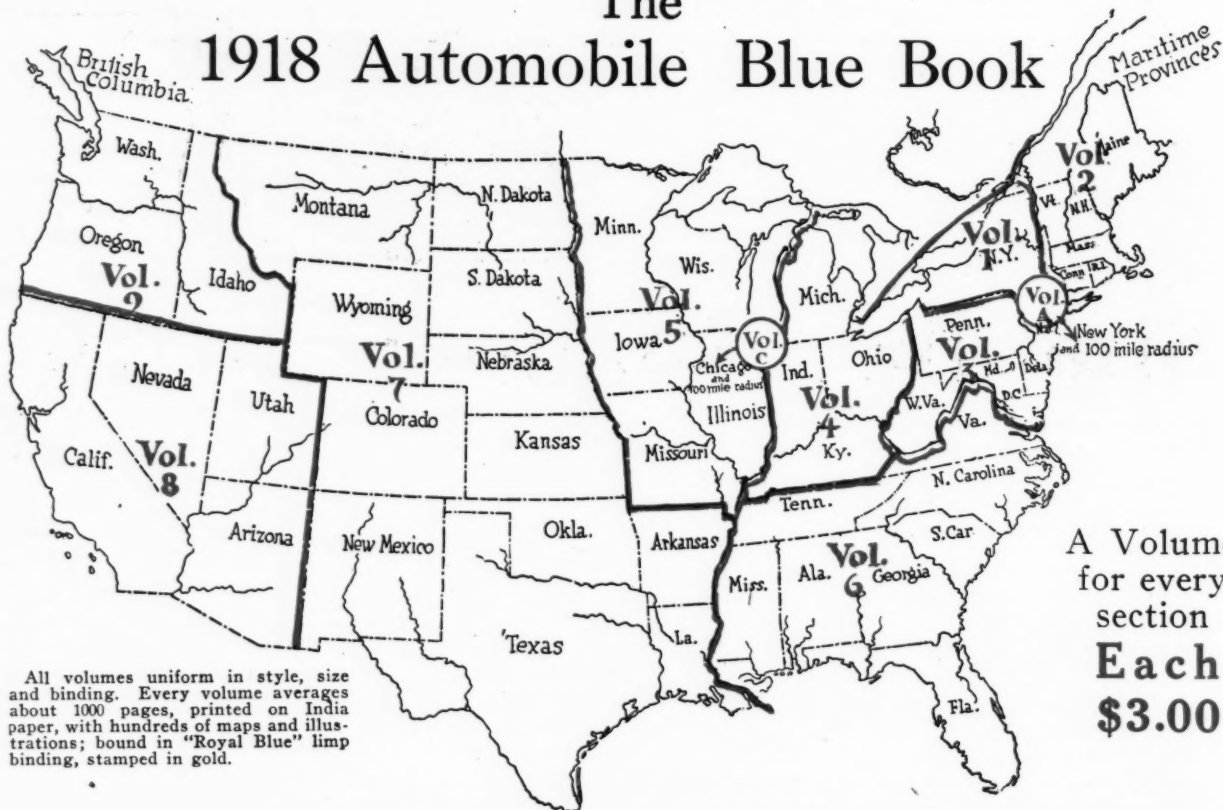
1913

45,000



1914

The 1918 Automobile Blue Book



All volumes uniform in style, size and binding. Every volume averages about 1000 pages, printed on India paper, with hundreds of maps and illustrations; bound in "Royal Blue" limp binding, stamped in gold.

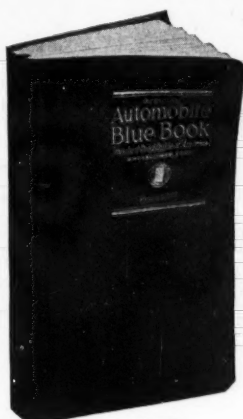
A Volume
 for every
 section
Each
\$3.00

is its increasing sale each year—
stood the test!

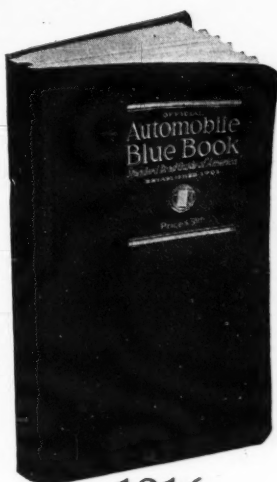
125,000

106,000

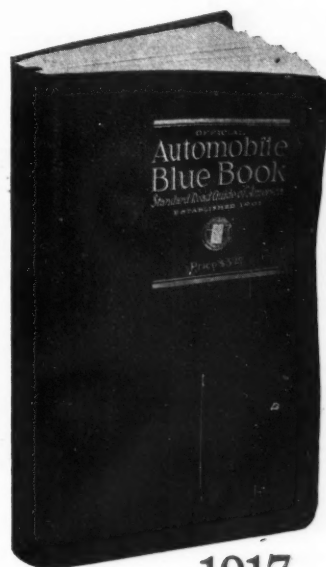
66,000



1915



1916



1917

DEALERS!

In less time than it takes you to give free road directions—or sell a cheap map—you can sell a Blue Book at \$3.00—make a Dollar or more profit—and insure your customers' satisfaction.

Besides—when you sell a Blue Book—you can sell other car and touring equipment. When motorists buy a Blue Book it is a clear indication that they are going to tour—and motorists who tour need a lot of equipment that you have.

There are maps and there are tour books, but since 1901 there has been but one Standard Road Guide of America—the Automobile Blue Book. Motorists know it and depend on it. It is known from Coast to Coast. It is the one comprehensive, accurate, up-to-date, complete automobile road guide for any part of the United States and adjacent Canada.

Take advantage of the constantly growing demand for Blue Books and the opportunity of getting more touring money as a direct result of their sale.

Let us send you a copy to look over and we will send you full information at the same time.

The Automobile Blue Book Pub. Co.

241-249 West 39th St., New York

900 So. Michigan Ave.,
Chicago

513 Pacific Bldg.,
San Francisco



MUNGER

"Always Tight" Piston Rings

The upper groove of a piston always becomes worn before the other grooves are affected, so that a piston ring of regular size will not fit snugly. To meet that condition, each complete outfit of Munger "Always Tight" Piston Rings includes one over-width ring for each piston and a Re-grooving Tool. With this tool the car owner or garage man can straighten-up a worn groove so an over-width ring will fit true and properly.

Munger "Always Tight" Piston Rings conform to the shape of the cylinder and the Expansion Joint keeps them gas-tight until worn out.

SPLITDORF ELECTRICAL CO.
Newark, New Jersey

SPLITDORF BRANCH HOUSES AND SERVICE STATIONS:

Atlanta.....	10-12 E. Harris St.	Minneapolis.....	816 Hennepin Ave.
Boston.....	68 Brookline Ave.	Newark.....	278 Hasley St.
Chicago.....	2613 S. Michigan Ave.	New York.....	7 W. 61st St.
Dallas.....	402 E. Ervay St.	Philadelphia.....	210 N. 13th St.
Detroit.....	1295 Woodward Ave.	Pittsburgh.....	5943 Elsworth Ave.
Kansas City.....	1827 Grand Ave.	San Francisco.....	1022 Geary St.
Los Angeles.....	1215 S. Hope St.	Seattle.....	1618 Broadway
	Toronto.....		469 Yonge St.

ACCESSORY DEALERS and GARAGEMEN!

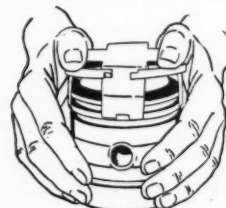
Any jobber will supply you with Munger "Always Tight" Piston Rings. Order them now.

List price for all sizes up to 3 3/4 in. diameter, \$1.25 per ring.

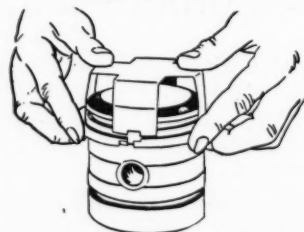
With each complete outfit of rings, a Munger Piston Regrooving Tool and a Munger Ring Insertion Tool are supplied without extra charge.



The Munger Re-grooving Tool in position for cutting. Testing width of groove with an overwidth ring



A Munger "Always Tight" Piston Ring being slipped over the Munger Ring Insertion Tool

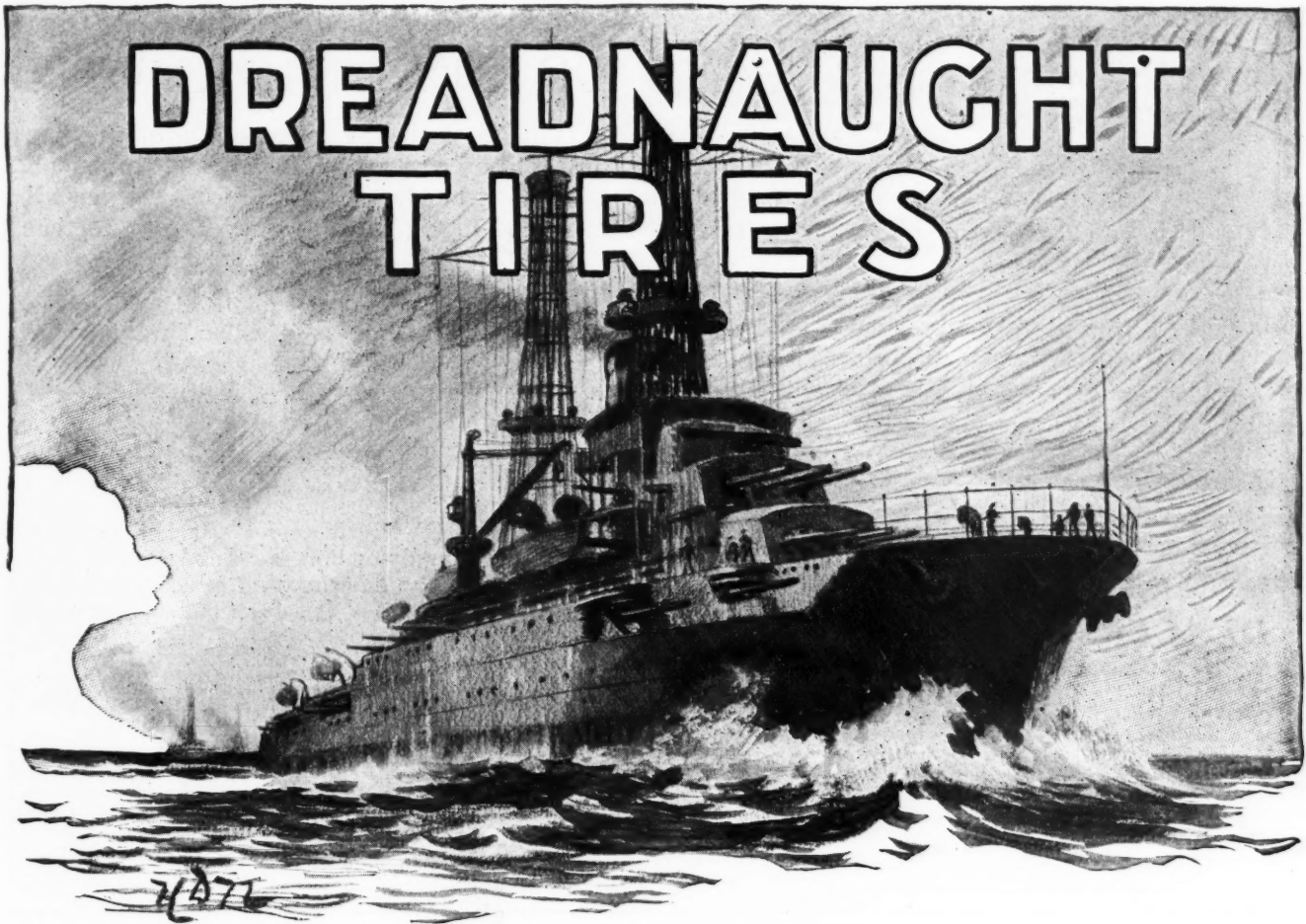


Showing how easily Munger "Always Tight" Piston Rings can be placed in the piston grooves with the Munger Ring Insertion Tool



The MUNGER 8 "Always Tight" Rings
"ALWAYS TIGHT" (Regular Size)
PISTON RING 4 "Always Tight" Rings
OUTFIT- (Overwidth)
Regrooving Tool
Ring Insertion Tool

When Writing to Advertisers, Please Mention Motor Age



THE DREADNAUGHT TIRE

is the supreme example of the spirit of the times. Its very name proclaims its strength and power and its ability to withstand the hardest wear and tear. The tremendous endurance of **DREADNAUGHT TIRES** is the sensation of the tire world today.

Made in two treads—the **DREADNAUGHT** Reinforced Vacuum which is anti-skid, and the **DREADNAUGHT** Ribbed which supplants the old time plain tread.



THE DREADNAUGHT TIRE AND RUBBER CO.

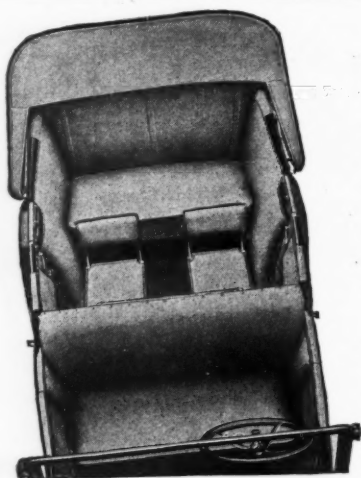
Baltimore, Maryland

We have an exceptional distribution proposition and assure excellent service and territorial protection with intensive co-operation from our organization. Write or wire Department "D."

CHAS. F. U. KELLY, Inc. Sales Dept. 1834 Broadway, N. Y.

GUARANTEED 5000 MILES

When Writing to Advertisers, Please Mention Motor Age



IT PAYS TO SELL GORDONS

GORDON SEAT COVERS with the new sectional overlap feature are easily sold. They are made for every American machine—give better service because the overlap relieves all strain on fabrics, seams and fastenings, and assures a perfect fit for every car.

When you consider that Gordon Seat Covers are sold exclusively from your catalog and sample fabrics—when you remember that you have no stocks nor capital tied up—and when you bear in mind that Gordons pay a splendid profit—then you know why dealers are staunch friends of the Gordon line.

Get some of the Gordon profits yourself. Write for Dealer's proposition today.

SEND FOR DEALERS' BOOK

Shows Gordon National Advertising, newspaper ads for your use, signs, window displays and booklets for your store. Gordon Dealer Book and Confidential Dealers' Catalogs sent on request.

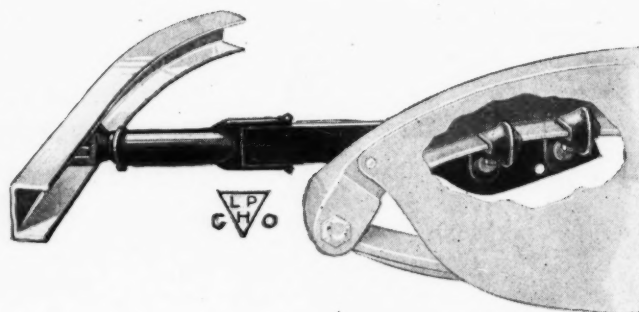
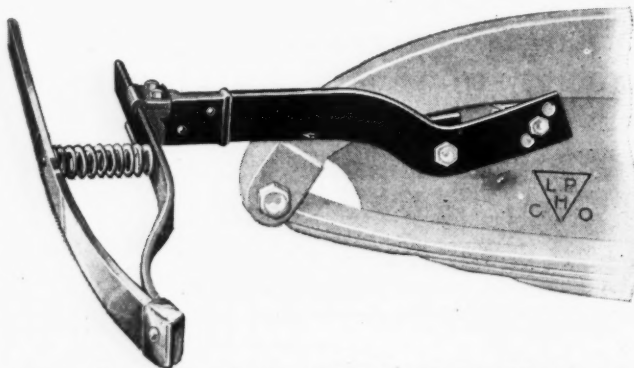
SEND FOR THEM TODAY

GORDON EASY ON TIRE COVER is easily attached without taking tire off holder. Fits very snugly on both sides and does not gap open. Complete protection from the deteriorating effects of sun or rain. Tire Covers and other accessories are described in our new dealers' catalog. Send for it.

THE J. P. GORDON CO., 308 N. Fourth St., Columbus, Ohio

GORDON
EASY-ON SEAT COVERS
—TAILORED TO FIT—

HALLADAY UNDER CLAMP BUMPER



The latest of the HALLADAY Line

The last word in Universal Adaptability

Fits practically every car with forward frame extension, regardless of dimensions or contour, or the style of the fenders or splash aprons.

Steel extension and unbreakable clamps fitted with all the HALLADAY bars. HALLADAY Class, Finish and Quality throughout.

L. P. HALLADAY COMPANY, Streator, Illinois

Quality Is Economy



THIS IS THE SIGN OF A HOOD DEALER

For overnight service, don't substitute. See Automobile Trade Directory and Chilton Directory for list of Hood Tire Distributors

The Foundation of Hood Tire Quality

is the carcass built of an extra number of plies of the finest possible fabric. This means maximum mileage, strength and protection from blowouts.

Hood has five grades of cotton to choose from, yet has selected for its fabric the longest fibre cotton grown in the world. No other fabric used in tire construction compares in strength and quality with that used by Hood.

A Hood Tire of any size is more than a match in durability and strength for the next larger size of a so-called standard tire, and the reason for this lies in the extra number of plies of the Hood extra quality fabric.

The quality of Hood raw materials and the care and skill used in their manufacture are reasons why constantly increasing numbers of critical tire buyers are asking their dealers for Hood Tires.

Hood Tire Co., Inc., Watertown, Mass.

New Pep in Old Motors

Over five million cars are in use; the old motors have to be overhauled and keyed up for service. Piston rings have to be renewed, to save gas and put pep into the motor. Here's your chance! Meet your customers half-way by having the piston ring that costs less, serves best and saves most,—the INLAND.

Big profits for you—big saving and best service for your trade. Your jobber has them in stock.

Inland Machine Works
803 Mound St., St. Louis, Mo., U. S. A.

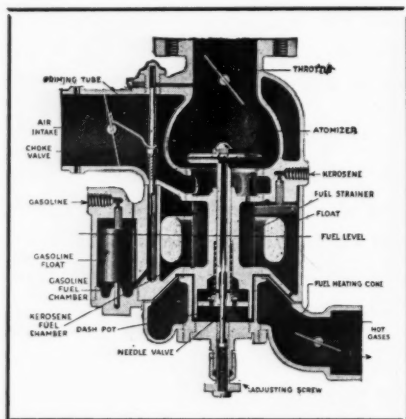
The patented Spiral cut makes the Inland absolutely gas-tight. One-piece construction makes it low-priced. Equal width and thickness make it strongest and most durable.

INLAND
1 PIECE PISTON RING

When Writing to Advertisers, Please Mention Motor Age

Model
"F"**KNOX**
CARBURETORModel
"F"

10% to 30% SAVING IN FUEL GUARANTEED

**DESCRIPTION**

THE simplicity of our carburetor is readily seen by a brief study of cross section cut. It can readily be seen how the fuel or gasoline enters the bowl of the carburetor, how it is taken care of by the float and passed up by the metering needle into the hollow stem of the atomizing valve, from there passing out through the multiple jets where it is picked up by the rushing air. The atomizing valve working automatically is caused to lift by the vacuum or rush of suctional air, this valve in turn rides up and down on the metering needle taking more or less gas as it moves up and down. The lower end of the atomizing valve is made in the form of a piston, which works in a chamber carrying fuel, and in turn acts as a dash pot, preventing the valve from chattering or pounding on its seat.

After 15 years devoted to Carburetor manufacture and development, we have finally perfected and now present, in our Model "F" Knox Carburetor, an instrument that we unconditionally guarantee will save 10% to 30% in fuel consumption and give a proportionate increase in engine power and flexibility OVER ANY OTHER CARBURETOR NOW ON THE MARKET!

This carburetor is absolutely automatic. It is simple in design and construction, having only one moving part. When once properly adjusted it takes entire care of itself and the engine's fuel supply. It is not affected by weather conditions or changes in altitude. The mixture is uniformly maintained throughout the entire range of speed and load.

30 DAYS' TRIAL. Attach one of our Model "F" Carburetors to your motor, and if you are not absolutely satisfied that it accomplishes all we guarantee, your money will be refunded on return of the carburetor, charges prepaid, within 30 days after purchase.

PRICES, \$18.00 up, according to size of Intake Pipe. Special manifold for Fords.

Write for Full Information. Dealers can sell under our full guarantee, which is a big sales help and satisfaction insurance.

CAMDEN ANCHOR-ROCKLAND MACHINE COMPANY

Manufacturers of KNOX Motors—Carburetors—Launches, CAMDEN, ME.

1440

DOUGLAS & RUDD MFG. CO.

Be Sure This Mark Is On Your Connections



THE MEN BEHIND

THE FACTORY

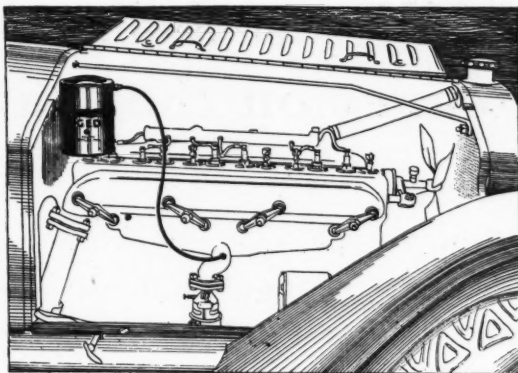
BEHIND THE MEN

CONNECTORS that CONNECT

DOUGLAS & RUDD MFG. CO. - BRONSON, MICH.

Over
500,000 PIECES
Assembled DailyWHICH INSURES
The Right Goods at the Right
Price at the Right TimeUsed on Over
70% OF ALL
AUTOS MANUFACTURED**BRONSON****Connectors That Connect****MICHIGAN**

When Writing to Advertisers, Please Mention Motor Age



Easily Attached to All Types of Engines. Patented June 11, 1918.

The GED

Gasoline Economizer and Decarbonizer

combines

Auxiliary Carburetion and Humidified Air

securing

Complete Combustion Saving of 25 to 40% in Gasoline
Decided Increase in Power
Removal of Carbon

The G E D acts continuously and automatically—has no moving parts to adjust, wear or get out of order. It is an investment—not an expenditure. It repays its cost over and over each season.

The G E D automatically supplies humidified air by the most improved and efficient method.

MOISTURE properly introduced with the explosive mixture, by the process of humidifying the air, is highly beneficial to engine operation.

This scientific fact is proven in practice by the decidedly improved operation of your car after night fall or in damp weather.

It is also an established fact that the free carbon formed is changed to gas by uniting with the steam into which the water vapor is converted at the combustion temperature. This gas is expelled by the exhaust and the cylinders are consequently kept clean.

Moisture also softens and removes existing carbon and is now used as a common method of cleaning the cylinders.

In addition, the G E D automatically provides auxiliary carburetion, which further improves combustion and releases the maximum percentage of the heat value of the fuel—while with the incomplete combustion generally obtained a large percentage of the heat units are undeveloped and pass out through the exhaust as waste gases.

Excellent agents' opportunity—the G E D demonstrates and sells itself. Write for particulars.

\$10

Delivered Anywhere
in the United States

Order the G E D through your dealer—or mail remittance direct to us, and we will send you the G E D at once by parcel post.

ATLAS AUTO SPECIALTIES CORP., 2120 Broadway, New York City

DRESS UP YOUR CAR WITH A DRIDEK TOP



The Most Remarkable Top Material Yet Produced

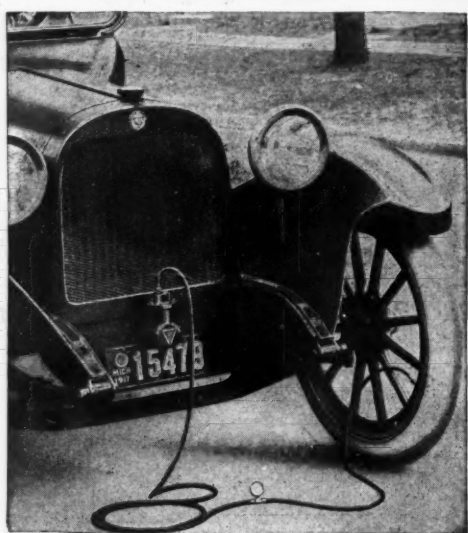
Light and strong, will not scratch or blister
Distinctive and attractive in appearance

Send for Samples and Price List to Dept. C

L. J. MUTTY COMPANY, Boston, Mass., U.S.A.



When Writing to Advertisers, Please Mention Motor Age



GEARLESS
DETROIT
CRANK-SHAFT
Tire Pump

Pat. Aug. 25, 1915

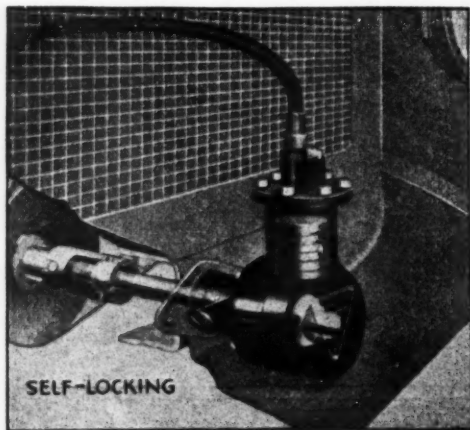
The mechanical principles of the Detroit Gearless were fixed after a long investigation and research covering the entire pump field. These principles are now acknowledged by authorities to be the only ones that are absolutely efficient for tire pump operation.

If there is a dissatisfied user of the Detroit Gearless, we have never heard of him.

On and off in a jiffy without tools.
Not a rubber diaphragm device. Price \$12.

WRITE FOR DETAILS

Detroit Accessories Corporation
520 Hillger Ave. Detroit, Mich.



Here's the Best Known and Biggest Selling Auto Cleaner on the Market

ZIT is safe to use on any car—even the most expensive limousine—for it's composed of ingredients that cannot injure the finest finish. It *protects* such a finish from the drying-out processes of heat, sun and wind, and by restoring the elasticity of the varnish keeps it from checking and cracking.

ZIT THE AUTOMOBILE DRY WASH

ZIT is also a splendid polish for pianos, phonographs, tables, chairs, hardwood floors and other woodwork.

Usually sold in combination with the Westfield Junior Sprayer with which it is applied.

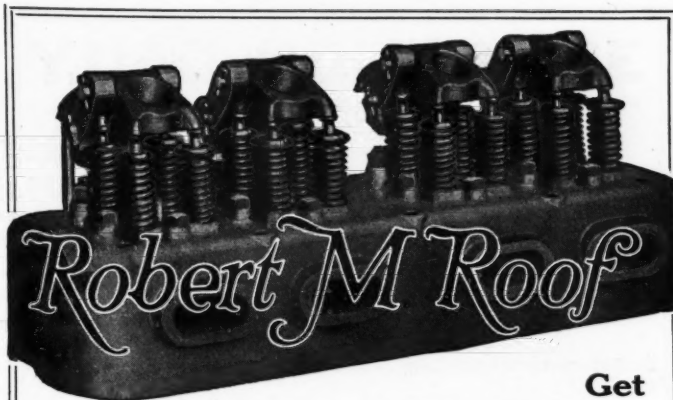
Introductory *Free Offer*

ZIT is a quick seller—a fast turnover—a heavy profit-maker. As a special inducement we offer a can *free* if you order 2 dozen *now*. Write that order *today*.

WESTFIELD CHEMICAL CO.
Westfield, Mass.



When Writing to Advertisers, Please Mention Motor Age



**Get
75 to 80 Miles
an Hour from Your Ford with These
Peugeot Type Cylinder Heads**

Your Ford will ramble faster than you can drive it on the road—and it will step away ahead of ordinary Fords on the race course equipped with ROOF'S Peugeot-Type Cylinder Heads, and 3 to 1 gear ratio.

16 OVERHEAD VALVES

—almost double its valve area, and there is absolutely no back pressure in the exhaust outlet.

Special equipment complete for speedster, touring car and truck. Why not double the value of your truck? Easy to install. Set right in the place of the old cylinder head. Rocker arms operate from the regular cam shaft. Our liberal C. O. D. offer will interest you. Write for free literature and complete details. Sells every month in the year. Rush season now on. Dealers, Garage and Repairmen, write.

Price \$100

LAUREL MOTORS CORPORATION

Successors to ROOF AUTO SPECIALTY CO., Anderson, Ind.

MADE IN THE PUNCTURE PROOF CITY

**Soft Tires Are Hard
on the Pocketbook**
*Keeping your air
pressure up
means keeping
your tire ex-
pense down.*
Test you air
pressure
daily
with a

**TWITCHELL
AIR GAUGE**

and double the life
of your tires.

At your dealer or
TWITCHELL GAUGE CO.
1516 S. Wabash Ave. Chicago, Ill.
PRICE, \$1.25

HERE'S a time-tried prescription that is guaranteed to cure your customers' tire troubles and give you instant relief from the adjustment nuisance:

For front wheels, Kelly Driving Tires, which give Kelly-Springfield mileage and steer easily.

For rear wheels, Kelly Kant Slip Fabric Tires or Kelly Non-Skid Cords. Either will hold the road and both give excess mileage.

For all four casings, Kelly Red Inner Tubes—red because they are cured with French antimony, not because they have been doctored to look as if they had.

Kelly- Springfield Tires and Tubes

make friends for themselves and for the man who sells them because they give the purchaser more mileage than he expects to get.

Kelly-Springfield Tire Company

Executive Offices
Seventh Ave. at 57th St.
NEW YORK

General Sales Office
4614 Prospect Avenue
CLEVELAND



Ohio Karbon Killer

Keeps Spark Plugs, Valves, Pistons and Cylinders free from carbon—all the time.

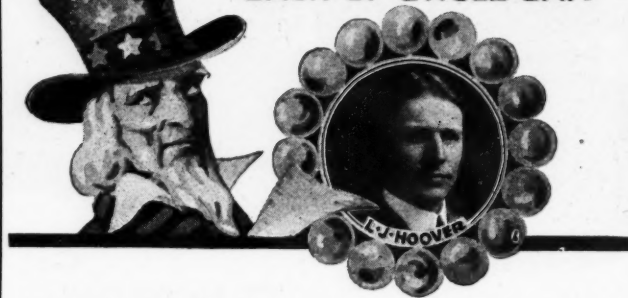
Don't let your engine choke up with carbon until it can't run, and then remove it—Prevent it!

Put Ohio Karbon Killer in your gasoline, and prevent the formation of carbon, thus keeping your engine in the very best condition at all times.

Costs \$1.00 per lb., and a pound treats 480 gallons of gas. Get a can right now, and give your engine a chance. If your dealer cannot supply you, send your dollar to

THE OHIO GREASE COMPANY
Box 121, LOUDONVILLE, OHIO

30 MILLION DAILY BACK OF UNCLE SAM



IN the production of Hoover Steel Balls more than 500 tons of steel is consumed monthly, which, in the terms of 1/4-inch balls, approximates 30,000,000 balls daily, or 10,950,000,000 annually.

That's the stupendous measure of the Hoover organization's contribution to the industrial life of America—a backing up of the nation's whirling war machinery with a mechanical product, indispensable to rapid, economic efficiency.

Hoover Steel Ball Company
Ann Arbor, Mich., U. S. A.

Power for Every Road and Load

Wisconsin

CONSISTENT

Truck Motors

NOTE THESE FEATURES:

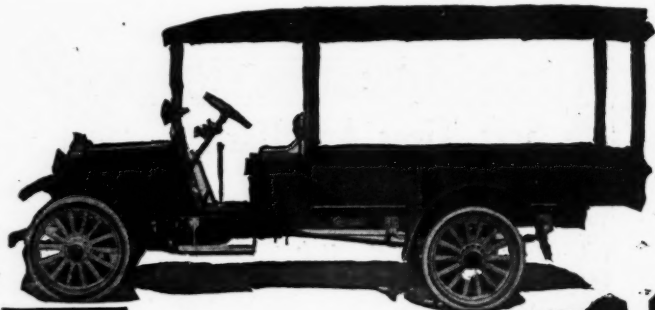
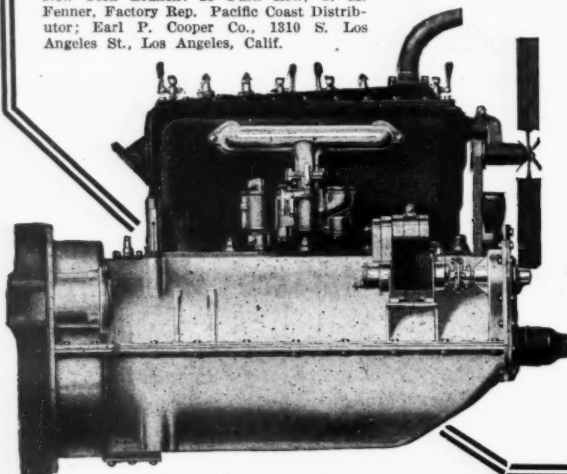
Cylinders—Cast en bloc. Crankshaft—Four bearing, chrome nickel steel, 2 in. diameter. Valves—Rich Tungsten steel. Connecting-Rod Bearings—3 in. long, 2 in. diameter. Bearings—Bronze, Fahrig metal lined. Cam-shaft—One piece, cams integral. Oiling System—Force-feed hollow crankshaft, 3 Point Suspension.

Write today for detailed specifications and illustrations

WISCONSIN MOTOR MFG. CO.

Sta. A. Dept. 311 MILWAUKEE, WIS., U. S. A.

New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast Distributor: Earl P. Cooper Co., 1310 S. Los Angeles St., Los Angeles, Calif.



Commerce

A Year Ahead of Other Trucks

The only truck having everything necessary on it—when you buy it

Three types of bodies for all models—Bijur Starting and Lighting System, with Dixie Magneto Ignition—Stewart Vacuum System—Pierce Governor—Windshield—Bumper. Continental Motor (3 1/2 x 5)—Tordenson Rear Axle—Detroit Steel Products Company Springs.

One-ton Chassis.....	\$1340
With Express Body.....	1375
With Post Top and Storm Curtains.....	1450
With Standard Stake Body.....	1490

THE COMMERCE MOTOR CAR COMPANY
DETROIT, MICH.

W. H. Brinkerhoff, Eastern Dist. Mgr.
Belmont Ave., Elmhurst, Long Island, N. Y.



How Do You Know When You Need Gas?

Answer that question without getting out of your car, walking around and wiping off a greasy gauge dial, or perhaps depending upon an inaccurate measuring stick. Equip your car with the Gasograph.

With this Gasoline Gauge installed on your dashboard, you know at a glance exactly how much gasoline you have—regardless of the tank's location or whether your car is running or standing still.

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The Gasograph is simple and easy to install and it fits all cars with gravity or vacuum feed. It is not an accessory, but a necessity, and,

Gasograph
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In ordering, state location, shape and depth of tank, or name and model of car.

Price, Car with tank in rear.....\$6
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Manufactured and Guaranteed by

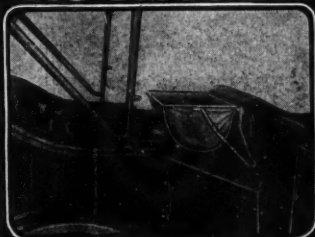
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Open—A Bed



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Sales of Rock-a-Bye products total in the hundreds of thousands

The Rock-a-Bye Auto Bed and Auto Seat are becoming the biggest sellers in the auto accessory field. Every car owner for years has been brought face to face with the problem of what to do with baby when motoring, and immediately we started to advertise the Rock-a-Bye Auto Bed and Auto Seat, orders poured in. For a time we were unable to catch up with the demand, but we are glad to announce that now we can make prompt shipments.

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Get your share of this big business. Send for literature and quantity prices. Order through your jobber or direct from us.

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*The Hollenden
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"Home of The Cleveland Auto Club"

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MOHAIR VELVETS

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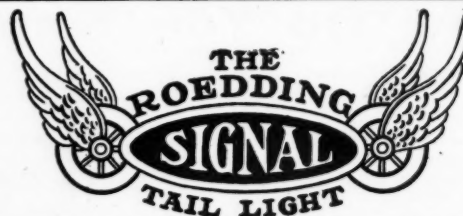
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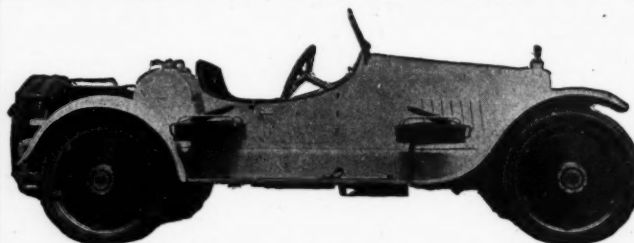


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Built to fit any make of car.
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MAKE YOUR OLD TIRES GO TO WORK AGAIN

Send along your old casings. From two old tires, by our special double-tread process, we will turn you out one tire ready for the road.

SIZE	If You furnish 2 Casings	If You furnish 1 Casings	If I furnish Both Casings	Special Gray Tubes
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32x3 1/2	4.25	7.25	9.00	2.55
34x4	4.50	7.75	9.50	3.10
32x4	4.75	8.00	10.00	3.20
34x4	5.25	8.25	10.25	3.30
36x4	5.50	8.50	10.50	3.40
36x4 1/2	5.75	8.75	11.00	3.50
38x4 1/2	5.75	9.00	11.50	4.10
38x4 3/4	5.75	9.25	12.00	4.25
36x4 3/4	6.00	9.50	12.50	4.35
38x5	6.25	10.50	13.50	5.00
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It makes no difference whether they are sand-blistered, punctured, rim cut or blown out.

McDANIEL WILL REJUVENATE THEM!

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for 150 makes of cars.
Write for full information
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for any make or model of car.

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Wire Wheels are *sellers!* Get particulars of wire wheel service and sales agent's propositions. Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for Ford cars.

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List price for sets of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel, \$60. White, black, red. Color optional.



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Those names tell the story of the ruggedness and dependability that is built into

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No man who knows trucks questions the Oneida's rank as one of America's great trucks.

Dealers who realize the sales possibilities of such a truck will write or wire, asking if their territory is still open.

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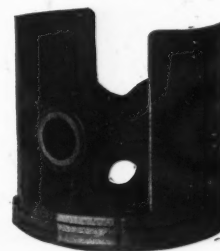
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Add Power and Economy To Ford Engines

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The extra light weight Ampeco Pistons means no lost power in driving the piston. This, in turn, means increased power and decreased gasoline and oil consumption.

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5-Passenger Touring	\$1,165	4-Passenger Roadster
All-Weather Sedan	\$1,645	Military Scout Model \$1,245

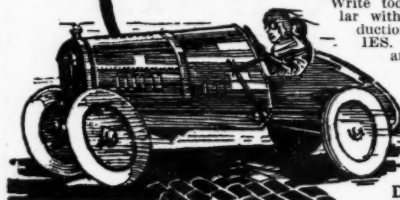
Every Elgin Six Combines Distinction,
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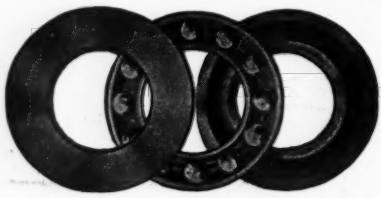
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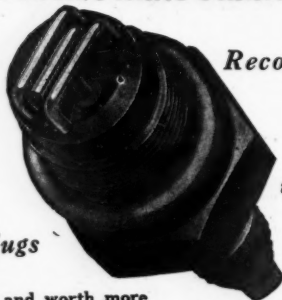
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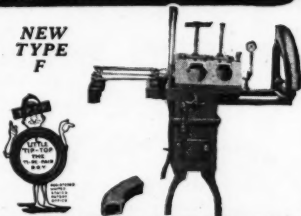
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TIP-TOP
OF AKRON
TIRE PAIR OUTFIT



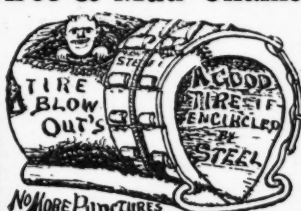
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Steel Tires & Mud Chains



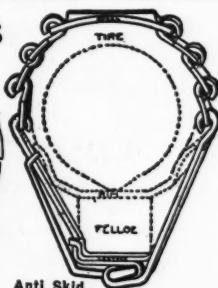
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Completely



Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

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Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

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The steadiest, most satisfactory and economical hand drill ever made.

Universal Motor (any current), ball thrust bearings, Chrome vanadium steel gears, forced draft cooling system. Fully guaranteed.

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Light Delivery, 1, 2, 3½ and 5-Ton

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DEALERS: Write or wire for desirable territory

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Price
only
\$1.50

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UTILITY Universal Rim Wrench
Now Belongs in Every Tool Box
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Automatically fits every nut used in connection with demountable rims on all makes of cars. Now beautifully finished in nickel and black enamel. More compact and lighter. Improved throughout. Selling on sight. Complete only \$1.50.

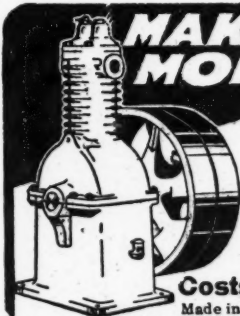
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Free From Oil means fewer punctures, increased mileage and less repairs. The Curtis Air Compressor is the only one that can't flood the cylinder with oil, because of exclusive mechanical safeguards.

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Made in 5 sizes and 125 combinations. Costs no more than any other kind.

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Branch Office: 530-H Hudson Terminal, New York

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SPARK PLUG
Always on the job

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MARSHALLTOWN IOWA

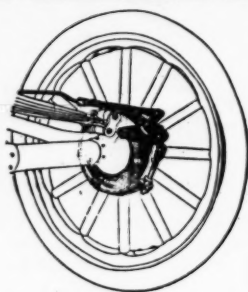
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This morning's mail (April 8th) brought in repeat orders from Dealers for 109 sets PLA-SAFE Emergency Brakes.

These dealers were not influenced to place these orders by clever salesmen or glaring advertisements, but have found that our Brake has merit, and when a few sets are placed on owners' cars, that an instant demand results.

Why not write us today for our Disc. and Big Selling Plan?

PLA-SAFE COMPANY
Successors to L. A. Leathers Co.
BROOKVILLE PENNSYLVANIA



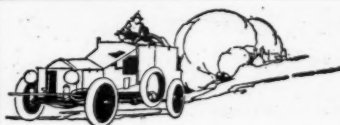
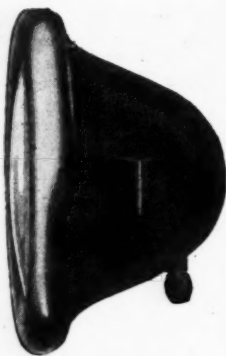
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Distinctive Headlights Make Your Car Different

Beautiful harmonious headlights add to the natural beauty of your car.

New and distinctive types of headlights are best built and designed by the largest manufacturer of automobile lamps

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Detroit Offices: 411 Union Trust Building



AT THE FRONT

On armored cars, trucks, tanks, airplanes and ambulances, these "Genuine Oil-less Bushings" are doing their part.

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TRADE MARK REG. U. S. PAT. OFF.

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U.S.A.

BOUND BROOK OIL-LESS BEARING CO.

Specialists in the manufacture of Oil-less Bushings for more than a third of a century

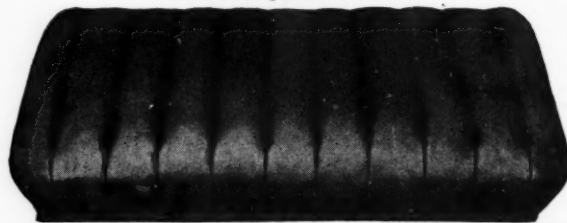
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Make Your Ford Ride Like a Packard or Pierce Arrow

Cathedral Pipe Deluxe Cushion

The Only Cushion in America That Makes All Kinds of Roads Seem Like an Asphalt Pavement



No Shock Absorbers Necessary. Sold Under a Positive Guarantee to Make Your Car Ride 100 Per Cent Better or Your Money Back. Let Us Tell You More About It.

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on the
Man Behind"*

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An automatic safety device that operates off the brake rod. If your Dealer does not handle, send in his name or order direct.

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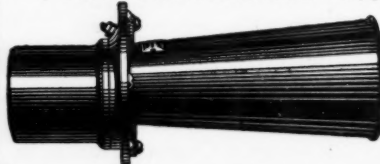
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616-617 Hippodrome Building
CLEVELAND OHIO



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**First Choice of
America's Best Cars**

Sparton Motor-Horns—Hand-Operated and Motor-Driven. Sparton Gasoline Vacuum Systems, Sparton Honeycomb Radiators and Sparton Radiator Fans. The SPARKS-WITHINGTON CO., Jackson, Mich., U. S. A.



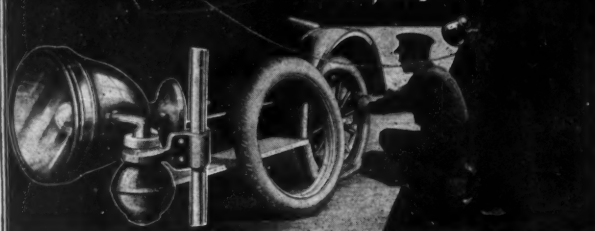
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Makes Tire Changing as Easy by Night as by Day

More than just
a Spotlight.



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"SIMPLY SHOW
THE GOLDEN
GIANT"

"IT SELLS
ON SIGHT"

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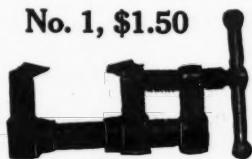
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Both Guaranteed. Either or Both Delivered
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Fit Any
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A LITTLE CARE GIVES YOU 100% EASIER RIDING, STOPS
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HOT SHOT MANIFOLD for Ford Cars

The intake and exhaust
manifold is cast in one
piece with a thin wall
separating them. Thus

the heat fully vaporizes the gasoline
which gives a hot, powerful explosion.

The Hot Shot Manifold eliminates carbon and oily spark plugs;
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CEDAR RAPIDS IOWA
Burlingham & Fraser, Sales Distributors



No Porcelain to break.
Mica insulation — the
brass shell won't rust
into cylinder head.

Sootless
\$1.25

Made by OAKES & DOW CO.
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"There's a difference in the
very appearance of A Sootless
Plug that makes it's sale easy"

**More Sales
For You Because
Of New Selling Plan**

We authorize you to equip any Ford Car with H. & D. Shock Absorbers and guarantee satisfaction. If, after 10 days' trial, the car owner is not satisfied with—

H. & D. SHOCK ABSORBERS

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Century batteries are built and sold for replacement only.
They are standardized batteries with Universal Terminals.
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Just 8!! Think of it! Three! They replace 51 shapes and
sizes and combinations of other makes of batteries and
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Universal Terminals means easy service.

Standardizing means cheaper manufacturing.

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" Uniformly Dependable "

The Wheeler-Schebler Carburetor Co. Inc.
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High and low tension magnetos, make-and-break coils, dash coils, box coils, motorcycle coils, switches, spark plugs and other ignition specialties. Guaranteed satisfaction.

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KOKOMO ELECTRIC COMPANY, Kokomo, Ind.

Winton Six

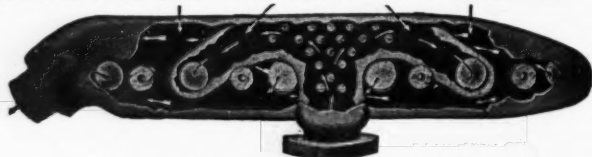
Your motor car needs to be so sturdy and dependable that it will not fail you at any time. You can triple your service to your country by having such a car as the Winton Six, a superb car that endures year after year.

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HOT-PIN MANIFOLD for FORDS

Exhaust and Pins Assure Uniform Heat Treatment of All Fuel	This Hot-Pin Chamber Breaks Up All the Fuel NO WASTE	Exhaust Gases Heat the Pin Chamber On All Sides
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40% to 50% Increase in Gasoline Mileage
Guaranteed or Money Refunded. Enlivens
Low-Grade Fuel by Pre-Heating Mixture

Price \$16.50 complete. Send for Literature. Dealers Wanted

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The absence of a metal housing to retain the oil is only one of the features of these universal joints. The patented positive system of lubrication is a superiority that you should investigate carefully. Booklet E tells the story. Write for it.

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Fast service, full measure and
perfectly filtered gasoline, as-
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"Guaranteed Tractor" Units
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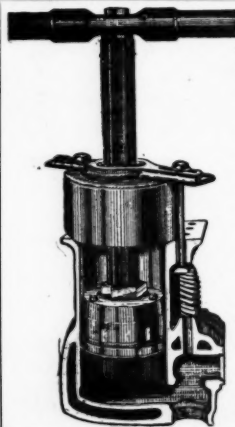
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Make More Profit Storm Reboring Machine

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The most practical machine for any
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Shortage of new cars makes it indis-
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We furnish machines of varied capacities from 2½-
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the system that ignites the gas at two opposed points at once? This burns the mixture completely and almost instantly; increases power and gasoline mileage; saves fuel and lessens carbon accumulation and spark manipulation. SU-DIG Series Spark Plugs added to the plugs now in your engine give Two Plug Ignition.

A wonderful improvement in the running of your car. No change in present equipment required. Write for free booklet, "How to Get More Power." Please mention car. Superior Motor Power Co., 135 C 5th Avenue, New York



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"The Accepted Standard"

BURD HIGH COMPRESSION RING CO.
ROCKFORD, ILLINOIS
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Speed**Strength****Endurance**

ROGERS ALL-STEEL TRAILERS, in all models, styles and sizes (½-ton to 10-ton capacity). Dumping Trailers, 4-wheel and 2-wheel Trailers, Semi-Trailers, highest quality, easiest running, longest lasting.

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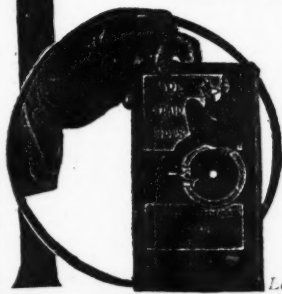
YOU get out of a bearing only what you put into it. We put in the best and most expensive bearing material known—chrome alloy steel.

**New Departure
Ball Bearings**



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To Motorists



Do you know why some car owners get over 15,000 miles from their tires? Do you know how Maurice Costello, the popular movie star, secured over 25,000 miles from his tires and won the \$300 Ajax Tire prize? Do you know why certain weather reduces your mileage? Do you know the proper inflation? Do you know why sand pockets rubber and fabric? Why spare casings and tubes deteriorate? All these questions are answered in our book, "Care and Repair of Tires," sent to any car owner free. Write today.

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Largest Mfrs. of Vulcanizers in the World

Waukesha
4-CYLINDER MOTORS
For Trucks and Tractors
Sizes 3¼ x 5¼ to 4¼ x 6¼
WAUKESHA MOTOR CO.
WAUKESHA, WIS.



**ELECTRIC
STARTING & LIGHTING SYSTEM
for FORD Cars**

The way absolute dependability has been achieved in this system is by building over 95 per cent of it in our own plant, where we can watch every operation and know it is right.

\$95.00 Completely Installed

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Immediate shipment, **VULCAN** seven leaf, heavy, oil tempered, fronts for the Ford. 588 other types, 90,000 springs in stock. Liberal discounts.

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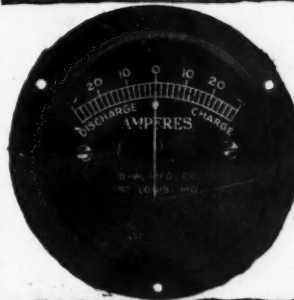


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STURDILY CONSTRUCTED to retain accuracy under the most severe conditions. Handsome in appearance. Made in both flush and surface types. Finished in bright nickel or black rubberoid as desired.

Better Ammeters Cannot Be Purchased.
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You Put It in the Gasoline
**Makes Carbon in the
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CLEANS your motor out and keeps it clean. Costs less from the start—the only Tonic for motors that gives continuous service. More than pays for itself in savings that go on as long as you use it.

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Two-Power-Range Eight

A "Loafing" Range for ultra soft, smooth, economical operation—a "Sporting" Range for exceptional power and speed.



Seven Passenger Touring
\$2550

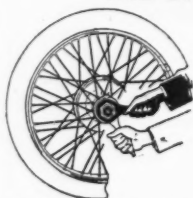
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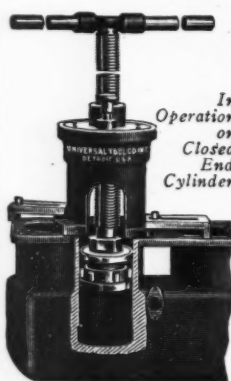
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TRANSMISSION FOR
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As simple in design as it is effective in action. Construction insures an absolutely rigid tool, with perfect centering device. Other new and revolutionary improvements that make cylinder reboring easy for any one to do.

Range of Expansion 2 1/2" - 5 1/16"

Write for free illustrated literature with complete details. Give Jobber's name.

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STARTING- LIGHTING SYSTEMS

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Special Outfits for Fords

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Built for Efficiency and Long Service. It is the oldest grease gun on the market and is still the most popular.



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THE CLEARING HOUSE

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FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS.
ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

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Buick, Model 25	90.00
Case, Model 40	75.00
Cadillac, Model 1914	150.00
E. M. F., Model 30	50.00
Flanders, Model 20	50.00
National	75.00
Packard, Model 1909	85.00
Premier 6 cylinder	100.00
Reo 1910	60.00
Mitchell 6 cylinder	75.00
Overland 42	50.00
Overland 59	60.00
Velie	75.00
Marmon	90.00
Rutenberg	125.00
Michigan 40	100.00

UNIT POWER PLANTS

Chalmers 6, 1913	\$125.00
Haynes	90.00
Hudson 6, 54	175.00
Hudson 37	150.00
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Krit	90.00
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Used Parts

for
300
Makes &
Models of
CARS
at 1/2 to 3/4
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If Not Satisfied, money
Cheerfully Refunded.

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Motor Driven Klaxet Horns, each	\$4.00
Electric Head Lights for Fords, pair	3.75
Head Lamp Doors for Fords, each	.65
Vulcanizer Kits, each	.75
3-in. Innershoes, each	.30
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Electric Side Lamps for Fords, pair	2.50
Oil Side Lamps, pair	2.75
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Piston Rings (all sizes), each	.30
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Spark Plugs (special), each	.25
Brake Shoes for Fords, each	.25
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(Below Market Price!)

Genolite Ignition Systems (Fords)	\$18.00
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Wagner Starters	15.00
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We carry a full line of New Gears for Transmission and Rear Axles for all standard makes of cars.
Prices on application! NEW CHUMMY ROADSTER BODIES \$200.00

THE ORIGINAL **AUTO PARTS CO., Inc.** of ST. LOUIS
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Rapid Fire Service and Lowest Prices ON GOOD SERVICEABLE PARTS FOR ALL CARS

If We Cannot Satisfy You, Money Cheerfully Refunded

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All in excellent condition	
4 cyl. 1914 Mitchell	\$100.00
4 cyl. 1913 Big Mitchell	100.00
4 cyl. 1914 Mitchell starter and generator	125.00
1914 Oldsmobile (Defender model)	100.00
4 cyl. Oldsmobile (Autocrat model)	150.00
6 cyl. Thomas Motor (cast in pairs)	125.00
1911 Packard	100.00
1912 36 Pierce Arrow	125.00
New Marion Motor	100.00
4 cyl. 1914 Moon with starter	100.00
4 cyl. 1913 Buda	85.00
1913 Atlas	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat)	100.00
1914 Marmon	100.00
1915 Krit	65.00
83 Overland with starter	85.00
6 cyl. 1914 Jeffery with starter and generator	125.00
6 cyl. Everitt	85.00

UNIT POWER PLANTS

4 cyl. Continental—complete	\$100.00
4 cyl. Milwaukee—complete	100.00
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1914 Premier	150.00
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6 cyl. Stevens-Duryea—complete	150.00
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1915 6 cyl. Master Chalmers	150.00
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1914 6 cyl. Oldsmobile	135.00
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Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

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Overhauled and Guaranteed	
DU4 Bosch Set Spark	\$18.00
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DR4 Bosch	18.00
DR6 Bosch	22.50
D4 Bosch	15.00
D6 Bosch	17.50
NU4 Bosch	15.00
ZR6 Bosch	35.00
Eisemann Dual	15.00
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We carry in stock all magneto parts

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Gray & Davis	\$15.00
Ward Leonard	12.00
Remy	18.00
Vesta	12.00
Beardon	12.00
Apple	10.00

Adjustable T Bumpers, nickel or black, fit all cars except Fords \$4.50 each

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Gray & Davis	\$15.00 to \$20.00
Remy	15.00
Ward-Leonard	20.00
Auto Lite, Bendix Drive	25.00
Auto Lite, Gear Drive	20.00
Wagner	25.00
Westinghouse	25.00
Delco	25.00

COILS

Bosch Type A	\$7.00
Eisemann	4.00
Spiltdorf	4.00
Simms, H. T.	12.00
Mea	10.00
Silent Starter and Generator Chains; all lengths and sizes	

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New steering posts	5.00

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\$150.00 to \$550.00
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

PREST-O-LITE TANKS

B-Presto Tanks	\$3.00
E-Presto Tanks	4.00
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Stewart or Warner	\$1.50 to \$4.00
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All Styles and Makes

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Reversible Firestone	2.00
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All other makes	1.50

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We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts	\$5.00
Front Axles	\$5.00 to \$10.00
Rear Axles	15.00 to 40.00
Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
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Stewart Vacuum Tanks	4.00
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Highest Prices Paid for Wrecked Cars

Largest Car Wreckers in the West

1915 S. State St., CHICAGO, ILL.

**Save
50%
to
80%**

USED PARTS

All Parts for Most Any Car Made

LET US FILL THAT ORDER

QUICKLY

RELIABLY SATISFACTORILY

**Save
50%
to
80%**

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Fully Guaranteed

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Buick, Model 17, 45 H. P.	90.00
Buick, Model 19, 40 H. P.	90.00
Buick, Model 21, 40 H. P.	90.00
Buick, Model 27, 35 H. P.	75.00
Buick, Model 25, 25 H. P., 1914.	125.00
Buick, Model 10, 22 H. P.	70.00
Buick 39	90.00
Chevrolet, 1916, S. & G.	150.00
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Everitt, 1912, 30 H. P.	50.00
Two Flanders, 1912, 3-speed.	50.00
Marion 37	100.00
Metz, 1913, 30 H. P.	45.00
Mitchell 6	125.00
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Overland, Model 52, 35 H. P.	70.00
Overland, Model 69, 30 H. P.	70.00
Overland, Model 79, 30 H. P., Gray & Davis Starter	85.00
Overland, Model 71, 40 H. P., U. S. L. Starter	90.00
Regal Underslung, 1913, 30 H. P.	50.00
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Studebaker, 1915, S. & G.	115.00
Studebaker 25	40.00

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Marathon, 1914, Starter	145.00
Maxwell, 1914	90.00
Hupmobile 32	110.00
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Buick 25	17.50
Buick 10	15.00
Buick 31	20.00
Buick 27	20.00
Buick 19	20.00
Buick M-40	22.50
Cadillac, 1911	20.00
Cadillac, 1910	20.00
Carter-car 5 A	20.00
Cutting	17.50
Chalmers F	17.50
Chalmers K	17.50
Chalmers M	20.00
Cole 6	30.00
E. M. F.	20.00
Flanders	15.00
Hupmobile 32	20.00
Jackson	17.50
Maxwell Special	17.50
Midland	20.00
Maxwell 25	17.50
Overland 59	17.50
Overland 90	25.00
Oakland 6	25.00
Hupmobile	12.50
Overland 69	17.50
Overland 79	20.00
Overland 71	20.00
Overland 54	17.50
Paige 25	17.50
Paige 36	22.50
Rambler	15.00
Stoddard-Dayton 30	15.00
Stoddard-Dayton 50	20.00
Hudson 33	20.00
Krit, 1914	20.00
Chalmers 6	30.00
Velie 40	20.00
Pathfinder 12	25.00

MAGNETOS

Bosch DU-6	\$30.00
Bosch DR-6	30.00
Bosch D-6	25.00
Bosch DU-4	25.00
Bosch DR-4	25.00
Bosch D-4	22.50
Bosch DU-4 Set Spark	20.00
Simms	\$17.50 to 30.00
Remy	7.50 to 15.00
Splittorf	7.50 to 15.00

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\$10.00 to \$60.00

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\$5.00 to \$35.00

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\$7.50 to \$35.00

STARTERS—

GENERATORS

\$25.00 to \$50.00

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Masters, any size	\$10.00 to \$15.00
Rayfield, any size	8.00 to 12.50
Stromberg, any size	7.50 to 10.00
Marvel, any size	7.50
Schebler, any size	5.00 to 7.50

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Any Make, Any Size, \$2.00 Up

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Any Make, Any Size

Transmission	\$2.00 to \$10.00
Differential	2.50 to 15.00

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New Departure, per set	2.50 to 10.00
Thrust, per set	1.00 to 2.50

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Any Size	\$2.50
Demountable	5.00

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If goods are not satisfactory, return them. Money cheerfully refunded.

There is a great deal of time lost in making inquiries. Make your letter an order and accompany it with a remittance sufficient to cover express charges. By doing this you will either get your parts quick or your money back.

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You lose nothing
through caution.

We guarantee every
part to be exactly as
represented or we will
refund your money.

Highest Banking
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E. M. F.	50.00
Studebaker 25	50.00
Studebaker 4-15	75.00
Overland 56	75.00
Overland 69	75.00
Overland 6, Continental	100.00
Peerless 45 H. P.	50.00
Partin Palmer	50.00
Firestone Columbus	60.00
Mitchell 4-40	75.00
Stoddard Dayton 30	60.00
Stoddard Dayton 45	75.00
Case 1911	75.00
Cadillac 1911	75.00
Cadillac 1912	75.00
Kissell 40	75.00
American 30	75.00
Moon 1912	75.00
Stearns 1911	75.00
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Buick 19	85.00
Locomobile 1910	90.00
Chalmers 6, 1915	100.00
Apperson 8 cyl.	100.00
Packard 6-48, 1914, with Starter, Generator and Bosch Magneto	300.00

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Haynes, 1910, Unit Plant	\$ 75.00
Chalmers model 17	100.00
Menominee Truck	100.00
King 1914	100.00
Auburn 1914	100.00
Elcar 1916	125.00
Allen 1916	125.00
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STARTERS

Gray & Davis, Maxwell	\$17.50
Remy, Mitchell 4-6	15.00
Ward Leonard	15.00
Auto Lite	12.50
Wagner	20.00
Bosch Fly Wheel Type	25.00
S-202, less fly wheel ring gear; Jesco 16-volt	20.00

GENERATORS

Auto Lite	\$17.50
Gray & Davis	20.00
Ward Leonard	15.00
Vesta	12.50
Beardon	12.50
Apple	12.50
Eskridge	12.50

MAGNETOS

Splitdorf Dixie	\$20.00
Mea	25.00
Bosch D-4	17.50
Bosch N-U-4	20.00
Bosch D-R-4	25.00
Bosch D-U-4	30.00
Bosch D-6	25.00
Bosch D-R-6	35.00
Bosch Z-R-6 and coil	50.00
Bosch Z-R-4 Dbl. Distb.	125.00

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Rear Axles	\$25.00 to \$50.00
Front Axles	5.00 to 15.00
Radiators	10.00 to 20.00
Transmissions	25.00 to 50.00
Bearings	50 to 50.00
Springs	1.50 & 2.50
Spring Leaves	25 & 50
Gears	1.50 to 15.00
Axle Shafts	2.00 to 10.00

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13th and Oak
Kansas City, Mo.

THE CLEARING HOUSE of USED PARTS

**1/2 to 3/4 off MANUFACTURER'S
PRICE LIST**

ANY PART FOR ANY CAR: Our Service makes it
necessary for you to write but one letter—and that one to US

If We Have Not the Part in Stock We Will Secure It for You at a SAVING
Is Your Car Listed Below? If Not, Write Anyway — We Will Secure It

Abbott	Buick	Empire	Hudson	Locomobile	Michigan	Paige	Reo	Studebaker
Abbott-Detroit	Cadillac	Everett	Hup-Mobile	Lozier	Mitchell	Peerless	R. C. H.	Thomas
Allen	Carter Car	Firestone	International	Marathon	Moon	Pierce-Arrow	Selden	Velie
American	Case	Columbia	Interstate	Marion	National	Pope-Hartford	Speedwell	Wayne
Amplex	Chalmers	Franklin	Jackson	Marmon	Oakland	Pope Toledo	Staver	Warren
Apperson	Cole	Glide	King	Mathewson	Ohio	Pratt	Standard-Six	Welch
Atlas	Courier	Great Western	Kissell	Maxwell	Oldsmobile	Premier	Stearns	White
Auburn	Detroit	Haines	Knox	Metz	Overland	Rambler	Stevens-Duryea	Winton
Bergdoll	Dorris	Halliday	Krit	Midland	Packard	Regal	Stoddard	

RADIATORS

ANY MAKE

From....\$12.50 to\$35.00

AXLES

FRONT AND REAR

From....\$10.00 to\$65.00

MOTORS

OVER 50 IN STOCK

From....\$50.00 to ...\$250.00

CARBURETORS

ALL MAKES

From.....\$3.00 to ...\$9.00

MAGNETOS

ANY MAKE

From....\$6.00 to\$35.00

BEARINGS

ANY MAKE

From.....50c to\$5.00

IF IT'S FROM MAXWELL IT'S GOOD!

Write Today to the BEST—BIGGEST

MAXWELL BROTHERS, 3931-35 Olive St., St. Louis, Mo.

Obtain Your Repair Parts From The World's Largest Auto Parts House

Over 2,000,000 new parts under the one roof. We do not wreck cars.

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6-volt Ward Leonard generators.....	\$15.00
6-volt Ward Leonard starting motors.....	15.00
Ward Leonard controllers.....	8.00
Connecticut type G. lighting switches.....	7.50
Connecticut type G. A. coils.....	7.50
6-volt Auto Lite generators.....	12.50
Bosch D. U. 4 magnetos, variable spark..	30.00
Complete electric lighting systems for Fords	10.00

STORAGE BATTERIES

6-volt Exide 100-hour batteries.....	\$20.00
6-volt Century 100-hour batteries.....	20.00
6-volt Willard 80-hour batteries.....	22.00
Battery boxes—all sizes, up.....	1.00

RIMS AND WHEELS

For all makes of cars, up.....	\$ 3.00
Houk wire wheels, 34x4½ and 36x4½, set of five wheels.....	75.00
30x3 front wheels for Fords.....	.75

SPRINGS

For all makes of cars, up.....	\$3.00
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Brand new Maxwell bodies that will fit Fords, Chevrolet 490, Hudson 20, R. C. H., and several other light cars:

Roadster type	\$30.00
Touring type	35.00
Late type Packard, 7 passenger, Packard body; complete with top and windshield.....	\$300.00
1915 5-passenger Studebaker body.....	40.00
Abbott Cloverleaf bodies, complete with top and windshield.....	150.00

These bodies are all brand new and ready for immediate shipment.

SPECIAL BARGAINS

Windshields for all cars, up.....	\$ 8.50
Transmissions for many makes of cars, complete, up.....	30.00
Front axles, up.....	10.00
Rear axles, up.....	30.00
Long slope speedster fenders for Fords— per set of four.....	10.00
Gasoline tanks, all shapes and sizes, up....	1.00

EXPERT REPAIRING

To all makes of Starters, Generators, Magnetos, Coils and anything electrical about the automobile. Radiators repaired, rebuilt.

TIRES

—Large assortment of standard size tires—	
30x3, smooth tread.....	\$10.00
30x3½, Non-Skid	14.50
31x4, Non-Skid	20.00
32x3½, Non-Skid	14.95
33x4, Non-Skid	21.70
34x4, Non-Skid	21.95

No mileage guarantee at these prices

Puritan Machine Co.

"All Parts for All Cars"

410 Lafayette Blvd. Detroit, Mich.

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BUYERS SAVE 50 TO 90%
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LIST

COMPLETE PARTS FOR OVER 200 CARS

REMEMBER WE HAVE IN STOCK ALL OF
THE TIME PARTS FOR OVER 200 MODELS
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Over 100 in stock at half price or better. All thoroughly tested by our radiator repair department and guaranteed water tight.

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A large stock. Fully guaranteed. \$25.00 up.

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Over 250, all types, at less than one-half factory price

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Of new quality at less than one-half of old list. (Keep in mind also that all prices have gone up.)

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Not scored. Unquestionably in fine condition. We won't ship blocks unless in good condition.

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Both new and old. Over three tons. Always half price or better.

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A THOUSAND. \$1.00 up. Rims of every kind.

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Two and one-half tons of springs. We can fit your car at ten cents a pound.

BEARINGS

Unlimited stock of bearings at prices unheard of before

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An immense stock at less than 50 per cent of list price. All makes.

MAGNETOS

Over 150 Magnetos. Various styles and makes at any price from \$3.00 up.

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Positively guaranteed. Fifty per cent discount and less.

LAMPS

of all kinds. Both new and old. Best of condition. Either gas or electric.

TIRES

We save you at least one-half. We rebuild tires with our own process. Our prices are lower than any competitors and our product better. Send us a trial order. We guarantee satisfactory service.

Why waste time and inconvenience yourself with small concerns?

The W-A-S-C-O WAY is the RIGHT WAY. Our Guarantee is your protection. Satisfaction or money refunded, quick.

There is a great deal of time lost in making inquiries. Make your letter an order and accompany it with a remittance sufficient to cover express charges. By doing this you will either get your parts quick or your money back.

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Salvage Company**

A SMALL PROFIT—A HOST OF FRIENDS
Sioux City, Iowa

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805-809 W. Douglas St.

EXCEPTIONAL VALUES IN MOTORS

Auburn 40.....	\$ 75.00
Buick 26	50.00
Buick 17	70.00
E. M. F.	40.00
Flanders	50.00
Overland 69	50.00
Overland 38	40.00
Overland 71	75.00
R. C. H.	50.00
Reo (5th)	100.00
Studebaker 25	60.00
Velie 40	75.00

UNIT POWER PLANTS

Buick 31	\$100.00
Buick 37	125.00
Chalmers 36	100.00

SPECIAL

WINTON SIX (Bosch Mag.).....\$200.00
AND MANY OTHERS!

PARTS FOR FOLLOWING CARS:

Auburn 30-40, Buick F-10-16-17-19-23-29-30-31, Burt 40, J. I. Case 40, Carter-Car F-A-L-R, Chalmers F-K-L-Six-10-11-M, Clark 40, Cadillac 1909-1910, Cameron, Detroit, E. M. F. 30, Enger 40, Flanders 2 & 3 speed, Fal Car, Fuller, Ford N-R-S (only), Great Northern, Halladay 40, Haines 1910, Hupp 20, Hudson 20, I. H. C. 2 & 4 cylinder, Jackson 2 & 4 cyl. 45—Olympic & Majestic, Krit, Kissel Kar, Knox 40, Lambert 2 & 4 cylinder, Lexington 40, Marathon 30-40, Marmon, Maxwell 2 & 4 cyl. K-Q, McFarland Six, Mitchell 40, Moon 40, Mason "May Tag" 4 cyl., Michigan 40, Monarch 40, Metz, Ohio, Overland 30-32-35-38-41-42-52-59-69-79-83, Oldsmobile 40, Oakland 2 & 4 cylinder, Paige Detroit—Roadster, Premier, Regal 30, Rambler 34-40-53, Reo 2 & 4 cylinder—5th, R. C. H., Rider Lewis, Sellers, Stoddard Dayton, Studebaker, Velie 30-40, Winton.

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We have on hand, at the present time, 20 different models of Motors from 20 to 40 H. P.

Money will be refunded on any parts, if for any reason they cannot be used, if returned within ten days.

Send to Wichita, Kansas, for Parts

Confidence

Built by Honest Dealings in superior Values. Let us save you money.

New and Used PARTS

FOR ALL CARS
GEARS SHAFTS
BEARINGS

At Lowest Prices—Write Us Your Needs

NOTE THE SAVING

	Factory Blemished	New Tires	Used Tires	Used Tubes	Double Tread Tires
28 x 3.....	\$ 9.35	\$1.85	\$3.50	\$1.25	\$4.15
30 x 3.....	9.10	2.00	4.00	1.35	4.75
30 x 3½.....	10.80	2.45	4.90	1.45	5.80
32 x 3½.....	12.65	2.65	5.75	1.50	6.75
31 x 4.....	16.65	2.80	6.75	1.65	6.95
32 x 4.....	16.95	2.90	7.00	1.60	7.15
33 x 4.....	17.70	3.35	7.75	1.70	7.80
34 x 4.....	18.10	3.50	8.25	1.70	8.00
34 x 4½.....	24.40	3.80	8.50	1.75	9.65
35 x 4½.....	25.50	4.00	9.00	1.80	10.15
36 x 4½.....	25.90	3.50	9.25	1.85	10.40
37 x 5.....	30.75	4.00	11.00	2.10	11.50

All tires 10% more for Non-Skid. Other sizes in proportion. Although no mileage guarantee at these prices, we will make an allowance on all tires that do not give reasonable service. One dollar or deposit sufficient to cover express cost required with each order.

Shipments Made Promptly
Subject to Inspection

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We Save You 50 to 80% of the Original Cost

MAGNETOS

Bosch DU Set spark.....	\$16.50
Bosch DU4 & 6 Variable.....	20.00
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Bosch DR6	20.00
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Coils, Generators and Starters. Silent Starter and Generator Chains, all lengths and sizes.	

Lighting and Starting Batteries, \$6.00 to \$15.00	Springs
Carburetors	Transmission
Front Axles	Gears
Rear Axles	Differential Gears
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Pistons, Cylinder Blocks,, Crank and Camshafts, Radiators, etc. Many good motors in stock. Tell us your needs

In wrecking cars we obtain and always have for sale a complete stock of parts for all makes of cars. Also tires and tubes whereby we can save you from 50 to 80 per cent

OUR SLIGHTLY USED TIRES AND TUBES

MEAN ECONOMY TO MOTORISTS :: A TRIAL WILL CONVINCE YOU

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	32x4.....	\$7.00	\$1.60	35x4 1/2.....	\$8.50	\$1.80
30x3 1/2.....	5.00	1.45	33x4.....	7.75	1.70	36x4 1/2.....	8.75	1.85
31x3 1/2.....	5.25	1.50	34x4.....	7.75	1.70	37x4 1/2.....	9.25	1.90
32x3 1/2.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3 1/2.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4 1/2.....	8.25	1.75	37x5.....	10.00	2.20

SPECIAL—Four 41x5 Tires, Rims and Tubes, \$80.00

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No Mileage Guarantee on Used Tires

Deposit Required with All Orders

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BUY YOUR USED PARTS FROM THE LARGEST USED PARTS CONCERN IN NEW YORK STATE

50 to 80% Off List Price

Crank Cases\$10 to \$75 | Cylinder Blocks\$ 5 to \$40
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Gears — Bearings — Springs

Our stock of the above parts is practically complete. Lamps, Tires, Carburetors, Magnetos, Coils, Wheels, Rear Axles, Motors. Anything for the automobile.

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NEW

Gears, Shafts and Bearings for over 600 models at great saving.

DEMAND

for our Double Tread Tires

PROVE

their serviceable qualities, especially adapted for hard country driving.

NOTE THESE VALUES

28x3.....	\$4.15	33x4.....	\$ 7.80
30x3.....	4.75	34x4.....	8.00
30x3 1/2.....	5.80	34x4 1/2.....	9.65
32x3 1/2.....	6.75	35x4 1/2.....	10.15
31x4.....	6.95	36x4 1/2.....	10.40
32x4.....	7.45	37x5.....	11.50

10% More for Non-Skid

One dollar deposit required with each tire ordered. Shipments made promptly with privilege of examination. No mileage guarantee at above prices.

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MANY FIRMS

Have built up a lucrative business by telling of their facilities and service in these sections.

WHY NOT YOU?

Write us what you have to sell and to whom you want to sell, as we are always glad to tell of our ability to serve you and our facilities for co-operating with you.

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PARTS FOR
200 Cars

Our immense stock assures you of getting what you want, very quickly and at a saving of from

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We have:

Motors	Radiators
Transmissions	Crankcases
Rear Axles	Crankshafts
Magnetos	Cylinder Blocks
Generators	Springs
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In fact, any part you may desire. It will pay you to let us have your order. Money refunded if goods are not satisfactory.

GET OUR PRICES TODAY

No matter how large or small your order is, it will be handled promptly and carefully, "The Key to Our Success."

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All orders for Lozier replacement parts are now being filled from our plant at Detroit—and nowhere else. We have discontinued all branch repair stations. In the future, all service correspondence and orders must be forwarded direct to us, as we do not guarantee the quality or accuracy of repairs purchased in any other way.

LOZIER MOTOR CO.

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Parts 50 to 80% off List

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Elmore	Matheson	Stoddard
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FOR OVER 35 MAKES OF CARS

Magnetos	\$ 8.00 to \$12.00
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Good used Tires and Tubes at Low Prices

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SAVE YOUR MONEY—Buy your Transmission and Differential Parts from us, 30% discount allowed from list on all rear axle parts.

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For Transmissions and Differentials.
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"Manufacturers for the Trade"

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Save 50-90 Per Cent

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Pope, Packards, Pierce, Knox, etc.

Motors, up.....	\$25.00	Presto Tanks, up...\$	4.50
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For Any Make or Model Car
50 to 80% Off Mfrs. List.
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Four cylinder motors in lots of 50 at \$30.00 each.
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Complete line of tires, used and unguaranteed factory
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Buy your parts for all models of Pope Hartford cars from the only legitimate and authorized manufacturers—who own the original drawings, patterns, tools and fixtures and are making these parts daily. Don't buy and use second hand parts. They may be the cause of serious accidents and result in much additional expense in the long run.

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For FORDS—Something New and Different

The new ROYAL RADIATOR SHELLS and HOODS change your old Ford into a 1918-looking model.
Special SPEEDSTER BODIES, HOODS, FENDERS,
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ONE PIECE DOUBLE STEP CUT
(Self Compensating Joint)

These rings assure increased power and save gas. All sizes in stock.

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Krit Owners We furnish quick service on all engines, clutch, trans-

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These Are All New parts

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Underslung parts for Fords, complete with instructions, per set.....\$20.00
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Over 800 Piston Patterns Always in Stock.

Our Expert Mechanics and our Highest Grade Equipment are your guarantee for highest class workmanship.

Our Special Light Alloy Pistons will give you More Power—More Speed; we also do Gear Cutting of Spur and Bevel Gears.

Write to Us Today

Auto Engine Works
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Cylinder Grinding

on special highest grade cylinder grinding machinery. No make-shift tools. Work handled by men with automobile factory experience. Large assortment of patterns for iron pistons. Complete stock of piston rings. Prompt service. Highest grade work only, fully guaranteed.

Aluminate Pistons and Aluminate Connecting Rods

Aluminate piston will put six cylinder smoothness into a four cylinder motor; improve a six or eight, give more power and quicker get-away. For prices, state make, model and year. Piston pins, aluminate connecting rods and racing motors.

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For Ford Cars
Keep the Motor Cool
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Complete stock—new and used—for all makes of cars. Every motor in perfect condition—no junk. We also build and overhaul motors, both automobile and aeronautical. Many a good car proves inefficient, due to motor trouble. We specialize in motor work, often changing a four-cylinder to a six, eight or twelve. Don't discard a car otherwise satisfactory because of motor trouble. Tell us your difficulty and let us solve the problem quickly, efficiently and at a reasonable expense.

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\$5.00 to \$10.00

Per cylinder, including pistons and rings

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Reground—We Weld Anything
Fitted with cast iron or light pistons; leak-proof or plain piston rings. Best equipped shop in the country. Quick Service—Reasonable Prices—Gear Cutting
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Piston Rings and Wrist Pins made to fit. All work guaranteed. Prices Right. Prompt Service.

Finest, Most Accurate Machinery
BEST SKILLED MECHANICS

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CYLINDERS REBORED

by our Expert Mechanics are PERFECT
New Pistons and Rings fitted. Complete job from \$4.50 to \$9.50.

SEND YOUR WORK TO OTTUMWA

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\$5 to \$11 per cylinder, including pistons and rings. Alloy pistons, from \$1.50 to \$3.50 per cylinder, extra. Ford cylinders reground and fitted with pistons, rings, wrist-pins and bushings for \$11 per set of four.

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High grade equipment assures best workmanship. Prices reasonable.

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WE GRIND

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Tires.

TIRES & TUBES

SLIGHTLY USED AND FACTORY REPAIRED
TIRES AND TUBES—QUALITY ABOVE ALL

The **QUALITY** of our tires and tubes is superlative, the **PRICE** cannot be equaled and our **SERVICE** cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	32x4.....	\$ 7.00	\$1.60	35x4½.....	\$ 8.50	\$1.80
30x3½.....	5.00	1.45	33x4.....	7.75	1.70	36x4½.....	8.75	1.85
31x3½.....	5.25	1.50	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3½.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4½.....	8.25	1.75	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

We will accept junk tires at 5c per pound as part payment on orders, when same are shipped to us by PREPAID express.

LINCOLN TIRE & SUPPLY CO.

1463 S. Michigan Ave. Dept. M. Chicago, Illinois

STANDARD MAKE

Our quotations are based on old prices. Write before any further increases. Our stock consists of all makes of blemished over-stock, close-outs, converted firsts, etc., with mileage guarantee removed, but warranted to give service and be fresh, clean tires.

Public Service Tire & Rubber Co. of N. Y.
1675 Broadway (Inc.) New York City

SECONDS AT 50% OFF

—Non-Skid Only—No Mileage Guarantee—
30x3.....\$ 9.25 31x4.....\$18.30 34x4½.....\$26.60
30x3½..... 11.75 32x4..... 18.70 35x4½..... 27.80
31x3½..... 12.65 33x4..... 19.60 36x4½..... 28.25
32x3½..... 13.75 34x4..... 20.05 35x5..... 32.65
10% Deposit Required, Balance C. O. D.
LAKEVIEW TIRE COMPANY
1339 Michigan Avenue Chicago, Illinois

TIRES

TUBES

**SPECIAL SPECIAL SPECIAL
ECONOMY TO MOTORISTS**

Select Your Supply Now for The Season—Slightly Used and Factory Repaired

TIRES and TUBES

A TRIAL WILL CONVINCE YOU

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires

AETNA TIRE & SUPPLY COMPANY

1429 Michigan Avenue

Chicago, Illinois

Odd Size

Pneumatic Tires

We can ship immediately from stock at attractive prices, odd size pneumatic casings or tubes, such as 31x4 straight side, 32x3 clincher, 34x3½, 35x4, 36x4, 36x3½, 37x4, 37x4½, 37x5½ in quick detachable or straight side. The above will be sold without a mileage guarantee.

These are all brand new casings! Standard makes. No seconds!

Send your orders or inquiries to

Powell Supply Co.

The Pioneer Auto Supply House of the
Central West

2051 Farnam St. Omaha, Neb.

Tires.

Tires.

Tires.

SLIGHTLY USED TIRES TIRES THAT HAVE BEEN

Bought from the large tire factories and are in excellent condition. All sizes ready for immediate shipment.

No mileage guarantee, but we warrant satisfactory service and will make any reasonable adjustment

30 x 3.....\$4.50	31 x 3½.....\$6.00	31 x 4.....\$7.00	33 x 4.....\$8.00	34 x 4½.....\$9.00	36 x 4½.....\$10.00	35 x 5.....\$11.00
30 x 3½.....5.50	32 x 3½.....6.75	32 x 4.....7.50	34 x 4.....8.00	35 x 4½.....9.50	37 x 4½.....10.50	37 x 5.....12.00

Specify whether clincher or straight side. Send \$1.00 deposit with each tire ordered. Balance C. O. D., with privilege of examination. Dealers given immediate attention.

TIRES THAT WILL

("Go the Guarantee Way and You Can't Go Wrong")

GIVE GOOD SERVICE

GUARANTEE TIRE & EQUIPMENT CO.

36th St. and Michigan Ave.
CHICAGO, ILLINOIS

High Grade New Non-Skid Tires

These tires were absolutely Firsts, only they are slightly mould-blemished and therefore purchased at a price without a mileage guarantee.

30 x 3, Plain...\$ 9.00	32 x 3½.....\$14.55	33 x 4.....\$20.25	35 x 4½.....\$29.15
30 x 3, N. S.....9.50	31 x 4.....19.00	34 x 4.....20.75	36 x 4½.....29.65
30 x 3½.....12.40	32 x 4.....19.40	34 x 4½.....27.95	35 x 5.....33.30
			37 x 5.....35.25

37x4½—Ribbed Tread Cord Tires.....\$40.00

All goods shipped promptly. \$1.00 deposit required with each tire ordered; balance C. O. D., subject to examination, at the above prices without a guarantee; specify whether new or used, clincher or straight side.

ROYAL TIRE & SUPPLY COMPANY

1461 Michigan Avenue
CHICAGO, ILLINOIS
Phone Calumet 2553

USED TIRES

30x3.....\$4.00	36x4.....\$ 8.50
30x3½... 5.00	34x4½... 8.75
32x3½... 6.50	35x4½... 9.50
31x4..... 6.50	36x4½... 9.50
32x4..... 7.00	37x4½... 10.00
33x4..... 7.50	35x5..... 10.00
34x4..... 8.50	37x5..... 11.00

Special Bargains

in

Slightly Used Tires

The kind that will satisfy all customers.

30x3.....\$4.00	34x4.....\$ 8.00
30x3½..... 5.00	34x4½..... 8.25
32x3½..... 6.00	35x4½..... 8.50
31x4..... 6.50	36x4½..... 8.75
32x4..... 7.00	37x4½..... 9.50
33x4..... 7.75	37x5..... 10.00

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

No Mileage Guarantee at the Above Prices

American Tire & Vulcanizing Co.

Phone: Calumet 5170

2136 S. MICHIGAN AVE. CHICAGO, ILL.

SENSIBLE BARGAINS AT SERLIN'S NO ADVANCE IN OUR PRICES

Business is sensitive. It goes where it is invited and stays where it is well treated. We invite yours.

NEW AND USED AUTO TIRES

STANDARD MAKE

	New Tires	Used Tires	New Tubes
30x3.....	\$ 8.35	\$ 4.50	\$1.80
32x3.....	9.50	5.00	1.95
30x3½.....	10.80	5.50	2.00
31x3½.....	9.20	6.00	2.25
32x3½.....	11.45	7.00	2.25
33x3½.....	13.40	7.50	2.35
34x3½.....	13.45	7.50	2.50
36x3½.....	12.65	7.50	2.65
30x4.....	14.20	7.00	2.70
31x4.....	16.65	7.00	2.75
32x4.....	16.95	8.00	2.80

FRESH STOCK

	New Tires	Used Tires	New Tubes
33x4.....	\$17.70	\$ 8.00	\$3.00
34x4.....	18.10	9.00	3.00
35x4.....	16.60	9.00	3.10
36x4.....	19.00	9.50	3.10
34x4½.....	24.60	9.50	3.30
35x4½.....	25.50	10.00	3.35
36x4½.....	25.90	10.00	3.40
35x5.....	27.00	12.00	4.00
36x5.....	26.60	12.00	4.10
37x5.....	30.10	12.00	4.20
38x5½.....	33.00	15.00	4.50

ADD FIVE PER CENT FOR NON-SKID

Mail orders filled same day received. Deposit sufficient to defray express charges will bring shipment, balance C. O. D., subject to examination. No definite mileage guarantee, but reasonable adjustments cheerfully made.

FIVE PER CENT DISCOUNT ALLOWED FOR CASH WITH ORDER

SERLIN TIRE CO., INC.,

1300-1302 Michigan Ave.
CHICAGO, ILL.

STANDARD MAKE USED TIRES

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.50	\$1.35	36x5.....	\$ 9.00	\$2.00
30x3½.....	5.50	1.50	34x4½.....	9.00	2.25
31x3½.....	6.00	1.60	35x4½.....	9.50	2.25
32x3½.....	6.50	1.75	36x4½.....	9.50	2.25
31x4.....	7.25	1.80	37x4½.....	10.50	2.40
32x4.....	7.50	1.85	35x5.....	11.00	2.50
33x4.....	7.75	1.90	36x5.....	11.50	2.50
34x4.....	8.00	1.95	37x5.....	12.00	2.75

No mileage guarantee at these prices

\$1.00 deposit required on each tire ordered.

Balance C. O. D., subject to examination. Also full line of high grade seconds.

SEND FOR PRICES

ARMSTRONG TIRE & VULCANIZING CO.

1336 Michigan Ave. Chicago, Ill.

Branch: 1612 Michigan Ave.

Phones: Calumet 5212, Calumet 5199

BILTRITE Rebuilt Tires That ARE REBUILT

After the tread is worn out 60 per cent of the tire's material value is still in the tire. It should be utilized. It should be rebuilt by the BILTRITE process. This consists of testing the tire, buffing the tread from the carcass, supplying a reinforcing fabric, then building up as is done in the standard tire factories. Such corporations as the New York Telephone Company, the Shredded Wheat Company, and the Green Fuel Economizer Company are practicing BILTRITE economy. Why don't you?

Size	You Supply Casing	We Supply Casing	Size	You Supply Casing	We Supply Casing	Size	You Supply Casing	We Supply Casing
30x3.....	\$ 9.10	\$10.60	33x4.....	\$17.25	\$19.00	35x4½.....	\$26.00	\$29.00
30x3½.....	11.25	12.75	34x4.....	17.75	19.50	36x4½.....	27.00	30.00
32x3½.....	13.50	15.00	35x4.....	18.75	20.50	35x5.....	28.00	31.00
34x3½.....	15.50	17.00	36x4.....	19.25	21.00	36x5.....	30.00	33.00
31x4.....	13.50	15.25	33x4½.....	22.50	25.00	37x5.....	32.00	35.00
32x4.....	16.75	18.50	34x4½.....	25.25	28.00			

Specify style of rim. Send \$1.00 deposit (orders to office; casings to factory). Tires sent promptly C. O. D. BILTRITE tires carry no mileage guarantee—but they are warranted to give satisfaction and will be adjusted on a basis of mileage given.

THE CONDEX TIRE COMPANY, Inc.

Factory: 685-A Eleventh Avenue

NEW YORK CITY

Office: 1416 Broadway

When Writing to Advertisers, Please Mention Motor Age

Tires, Magnets and Service Stations.

Tires, Magnets and Service Stations.
Radiator and Lamp Repairing.Radiator and Lamp Repairing.
Miscellaneous.**HIGH GRADE QUALITY TIRES & TUBES**
Manufacturer's Surplus Stock of Factory Seconds

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3.....	\$ 8.35	\$ 8.75	\$1.80	34x4.....	\$17.55	\$18.45	\$3.40
30x3.....	7.95	8.55	1.95	36x4.....	18.95	19.60	3.65
30x3½.....	10.35	10.95	2.30	34x4½.....	22.60	24.90	4.15
32x3½.....	11.65	12.90	2.40	35x4½.....	23.60	25.10	4.30
31x4.....	16.15	16.90	3.00	36x4½.....	23.90	26.60	4.40
32x4.....	16.55	17.30	3.05	37x5.....	30.75	31.45	5.30
33x4.....	17.10	17.85	3.25	35x5.....	29.85	31.30	....

We warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee

5% FOR CASH IN FULL WITH ORDER.

Save this discount, as upon arrival of shipment you still have the privilege of returning any items which do not come up to expectations for full cash refund.

STERLING TIRE & SUPPLY HOUSE

1355 Michigan Avenue

CHICAGO, ILL.

Slightly Used Tires**STANDARD MAKES—NO JUNK**

Size	Tire	Size	Tire
30x3.....	\$4.00	36x4.....	\$ 8.25
30x3½.....	4.70	34x4½.....	8.25
32x3½.....	5.70	35x4½.....	8.25
31x4.....	6.20	36x4½.....	8.50
32x4.....	6.75	37x4½.....	9.25
33x4.....	7.00	35x5.....	9.00
34x4.....	7.50	36x5.....	9.00
35x4.....	8.00	37x5.....	10.00

—No mileage guarantee at above prices—
Specify whether Q. D. Clincher or Straight Side
\$1.00 Deposit Required on Each Order, Balance
C. O. D., Subject to Examination**Delco Tire and Vulcanizing Company**

1545 S. Mich. Ave. Ph. Calumet 4858 Chicago

TIRESFactory Blemished ALL STANDARD MAKES
No mileage guarantee.**Order from Us and Save Money**
Money Back if Not Satisfied

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3.....	\$ 8.25	\$ 9.25	34x4.....	\$18.50	\$20.50
30x3½.....	10.75	12.50	34x4½.....	23.50	26.00
32x3½.....	12.25	13.50	35x4½.....	25.00	27.50
31x4.....	15.80	18.50	36x4½.....	26.00	28.50
32x4.....	16.75	19.25	35x5.....	29.00	31.00
33x4.....	17.75	19.75	37x5.....	30.00	32.50

Other sizes in proportion.
Special Prices on Tubes Tires Sent Anywhere
10% with order, balance C. O. D., subject to inspection
THE OHIO GUARANTEE TIRE & RUBBER CO.

5510 Euclid Ave. CLEVELAND, OHIO

(Dealers wanted)

RADIATORS

Get a Square Tube Radiator, 25% greater water capacity. Made for any car. New, guaranteed cores placed in old radiators. We also manufacture hoods, fenders, tanks and pans, and do guaranteed repair work. Prompt and satisfactory service.

CHICAGO MANUFACTURING CO.
1458-60-62-64 Michigan Avenue Chicago, Ill.**RADIATORS REPAIRED PROPERLY**

Anybody may attempt to repair your radiator. To succeed is another matter.

SEND IT TO DENVER**W. H. NEVEU, "The Radiator Man"**
Largest in the West. 1327-35 Broadway, Denver, Colo.**HIGH GRADE TIRES AND TUBES**

Factory Seconds, Unguaranteed, at Interesting Prices. Also complete line of Firsts. Write Us Your Needs

ACORN TIRE & REPAIR CO.

1547 So. Michigan Ave. CHICAGO, ILL.

IF IT'S ELECTRICAL WE CAN FIX IT**ANY STARTING, LIGHTING, IGNITION SYSTEM****WE OFFICIALLY REPRESENT**BERLING MAGNETO CONNECTICUT
PHILBRIN BENDIX DRIVES
WESTINGHOUSE JESCO (Jones Starter)
K. W. IGNITION DYNETO
HEINZE SPRINGFIELD FORD STARTERS
VAN SICKLEN SPEEDOMETERS
WALTHAM SPEEDOMETERS
BRANFORD CARBURETOR**LET THE MAN WHO KNOWS HANDLE YOUR REPAIR WORK****Arthur Jones Electric Co.**Established 1903
2837 S. STATE ST. CHICAGO, ILL.**OUR MODERN SHOP****IS AT YOUR SERVICE ON Everything Electrical**

Magnets, Coils, Starter Motors, Generators and Batteries

OFFICIAL REPRESENTATIVES FOR
Exide Batteries, U. S. L. Starting and Lighting Systems

General Electric Tungar Rectifiers

MOTOR CAR SERVICE CO.MAIN OFFICE 524-E E. 35th St.
Phone—Douglas 1600
BRANCH 3911 Sheridan Rd.
Phone—Lakeview 7706
CHICAGO, ILL.**SEND IT TO DETROIT****FACTORY REPAIRS FOR YOUR ELECTRICAL STARTING, LIGHTING AND IGNITION EQUIPMENT**

Our shop handles automobile factory work for the electrical manufacturers. Trained factory experts to repair and test your equipment. Complete parts stock insures prompt service.

Official Representatives & Service Station ForBijur Auto-Lite Berling Magnets
Dyneto Connecticut Ignition
Westinghouse K-W Ignition
Eclipse Bendix Philbrin Ignition
Tillotson Carburetors Norma Bearings
Heinze-Springfield Ford Starters
Atwater-Kent Ignition**Auto Electric & Service Corporation**
11-13-15-17-19 Selden Avenue**Expert Repair Service****ON EVERY KNOWN**
MAGNETO IGNITION SYSTEM
GENERATOR STARTING MOTOR
ARMATURE WINDINGAll Repairs Promptly Executed
All orders for repair parts shipped the day orders are received**AMERICA'S MOST COMPLETE**
IGNITION, LIGHTING AND STARTING INSTITUTE**PELLET MAGNETO CO.**Twenty-fifth and Wabash Avenue.
CHICAGO**Radiators Properly Repaired**

Do not spoil your radiator by trying to stop leaks with material that will eventually cause you to buy a new one. Send it to us, we will repair it and make it good as new.

Quick Service**THE AUTO RADIATOR CO.**
401 Lincoln Way, East South Bend, Indiana**RADIATORS**

We repair Radiators of all kinds—Any Make or Any Style

MITCHELL RADIATOR REPAIR COMPANY
933 Ft. Wayne Ave.Indianapolis Indiana
Buy and Sell Used Radiators**WE PAY CASH FOR PLATINUM SCRAP**

Mercury, contact points, old false teeth. Send us what you have for disposal, no matter how much or how little, and we will remit full market value by return mail.

THE MUTUAL SMELTING & REFINING CO.
54 South Front St. COLUMBUS, OHIO**Samuel L. Winternitz & Company AUCTIONEERS****Largest Liquidators of Motor Plants****FIRST NAT. BANK BLDG. CHICAGO, ILL.**

If looking for factory with iron and wood machinery, good shipping facilities, in Middle West, on easy terms, write now to

FACTORYBox E-858 c/o MOTOR AGE
—Would Take Part Pay in Stock if Satisfactory—**PATENT FOR SALE**

Puncture Proof Tire can be made for any make tire.

No Inner Tube**JOHN H. KOSSMANN**
2143 Hickory St. St. Louis, Mo.**Pioneer****RADIATOR Manufacturers**

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your Radiator down East when you can ship to us; save time, expense, freight, money, and be assured of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.

TODD MANUFACTURING CO. Minneapolis, Minn.**SECOND HAND ELECTRIC MOTORS**
We make a specialty of, and have the largest stock of SECOND HAND electric MOTORS and GENERATORS in America, and buy and sell, rent, exchange and repair electrical machinery of all kinds.**GREGORY ELECTRIC COMPANY**
16th and Lincoln Streets CHICAGO

Patents and Patent Attorneys.
Mailing Lists.

Cars for Sale. Supplies and Accessories.
Business Opportunities.

Help Wanted.

PATENTS

Write for How to Obtain a Patent, list of Patent Buyers and Inventions Wanted. \$1,000,000 in prizes offered for inventions. Send sketch for free opinion as to patentability. Our Four Books sent Free. Patents advertised Free. We assist inventors to sell their inventions.
VICTOR J. EVANS & CO., 783 Ninth, Washington, D. C.

C. L. PARKER

Formerly Member Examining Corps, United States Patent Office
ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS
American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request.
McGill Building, WASHINGTON, D. C.

AUTO MAILING LIST

44,755 Auto Dealers, U. S. \$3.00 per M.
7,949 Ford Dealers, U. S. \$20.00, or 4.00 per M.
5,519 Truck Dealers, U. S. \$12.00, or 4.00 per M.
(Showing make of truck handled.)
150,000 Truck Owners, U. S. 7.50 per M.
5,400 Truck Owners in Chicago, \$15.00, or 3.50 per M.
46,943 Garages, U. S. 3.00 per M.
55,967 Auto Supplies, Retail, U. S. 3.00 per M.
45,054 Repair Shops 3.00 per M.
404 Auto Mfrs. 3.00 per M.
73,674 Auto Dealers, Garages, Supplies and Repairs in one list, no duplicates 3.00 per M.
1,502 Auto Supply Jobbers \$5.00
Complete list auto owners and Ford owners, \$2.50 per M. Further particulars

TRADE CIRCULAR ADDRESSING CO.
166 W. Adams St. (Franklin 1182) Chicago

FORD SPEEDSTER FOR SALE

Vern Abbott, having been called to the army for perhaps an indefinite period, offers his Ford Racer for sale. It took 2nd prize in Ill. Championship Race at Chicago Speedway, 1916. Rebuilt, new frame and body design. Straight line drive. Newly painted and equipped for speed. Address

C. T. ABBOTT
219 E. Judd Street Woodstock, Ill.
Phone 262 W.

ROLLER BEARINGS

FRICTION-LESS

For Automobiles, Trucks, Tractors and Aeroplanes
OWEN Roller Bearings, manufactured under new process, for heavier loads and longer service. Write for information and prices.

OWEN BEARING COMPANY
438 Summit Street Pittsburgh, Pa.

WANTED

Factory Representatives

must be of high standing and have wide acquaintance among the jobbers and manufacturers of the automotive industry, to sell an automobile accessory, well known throughout the country.

Box E-859
c/o MOTOR AGE

WANTED

A good mechanic that is not in the first draft
GILSTRAP BROS.

Gillett Wyoming

CONTRACT WORK

Advertisers in this section have facilities at their disposal to take on additional work on contract. Automobile specialties of all kinds manufactured on contract basis. Special machinery, press work, auto machine work, foundry work, automatic screw machine work.

METAL STAMPINGS, JIGS, DIES, GAGES, SPECIAL TOOLS, ETC.

KRASBERG MFG. CO.

536 LAKE SHORE DRIVE CHICAGO
Opp. Municipal Pier

PARTS and ACCESSORIES

We are in a position to manufacture PARTS and ACCESSORIES. Will manufacture on contract or royalty basis. Prompt attention and delivery. Send us your proposition and blue prints.

SCHLOEMER MFG. CO.
388-90-92 Division St. Oshkosh, Wis.

Powr Plus

The simple, certain solution
of the piston ring problem

Watch for Announcement and Campaign in Motor Age



Inner armor for automobile tires. Prevent punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

INSYDE TYRES

AMERICAN ACCESSORIES CO. 259 Gulow St., Cincinnati, Ohio

ISN'T YOUR CAR ON OUR LIST?

Its Chassis Is Probably Designed to Fit a Special Kellogg Installation

Used by Over Half a Million Motorists
KELLOGG Engine Driven Tire Pump
Standard Equipment on 90% of all Fully Equipped Cars

Ask Your Repairman or Write Us Direct
KELLOGG MANUFACTURING COMPANY Rochester, N. Y.

BETHLEHEM MOTOR TRUCKS

"DEPENDABLE DELIVERY"

1 1/4 TON CHASSIS, \$1295
2 1/4 TON CHASSIS, \$1915

All F. O. B. Allentown

Built to dominate the truck business in your territory—backed by the Bethlehem guarantee and a strong national advertising campaign. Is your territory covered?

BETHLEHEM MOTORS CORP., Allentown, Pennsylvania

No Lights! No Spark! Now What?

What if your electrical equipment should fail you on a black night, suddenly, without warning, on a bad part of the road? Don't let it happen! Put a



Weston
MODEL 354 AMMETER

On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us!

Weston Electrical Instrument Co.
10 Weston Ave., Newark, N. J.
23 Branch Offices in the Larger Cities

SUNDERMAN Vacuum Carburetor

SUNDERMAN CORPORATION, 11 Chambers St., Newburgh, N. Y.

APPLY A

NEW TOP COVER

TO YOUR OLD CAR AND MAKE IT LOOK NEW

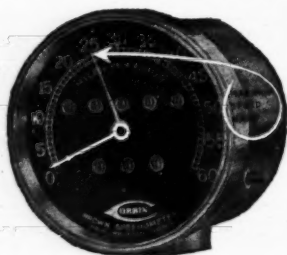
Prices \$8.00 to \$17.00. Parcels Postpaid

You Save 2/3 Price of a new Top, and can apply it yourself. Why sacrifice your old car? Many are better than the new ones. Get our catalogue. It's a money saver.

We specialize in Top Covers, Auto Tops, Tires, Seat Covers.
Wheel Top & Hardware Co., 126 E. 8th St., Cincinnati, O.

You Will Be Sure

of your route when your mileage is checked against the road map with the always-accurate



CORBIN-BROWN SPEEDOMETER

Correct in design, simple and strong in construction, the Corbin-Brown gives the perfect reliability you need. Motorists everywhere recommend it. Dealers everywhere can supply it.

Add to your comfort and safety with the Maximum Speed Hand, an extra feature, which registers the highest speed attained and remains at that point until reset to zero. It does away with the bother and danger of watching the speedometer while driving at a fast pace.

Write Today for Catalog

CORBIN SCREW CORPORATION

AMERICAN HARDWARE CORPORATION, Successor

New Britain, Conn.

BRANCHES: New York Chicago Philadelphia

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Try "KOO special" grade for gears and "K000" for bearings. Ask your dealer for NON-FLUID OIL in the orange colored cans.

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OMAHA, NEBRASKA

Bricton Pneumatic Tires



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Position is permanent if you make good. And increased earnings are also assured the top-notch men.

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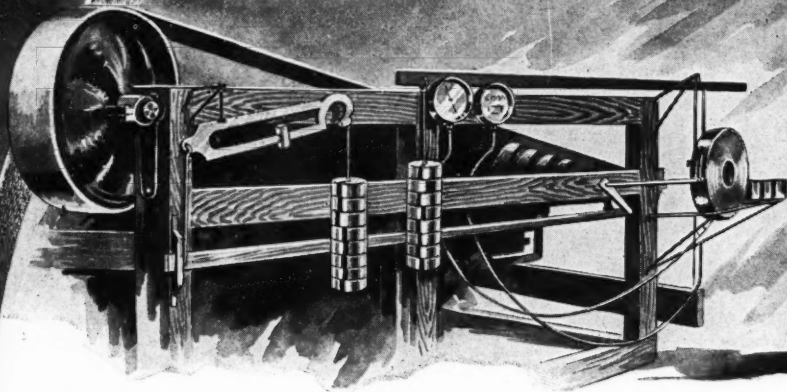
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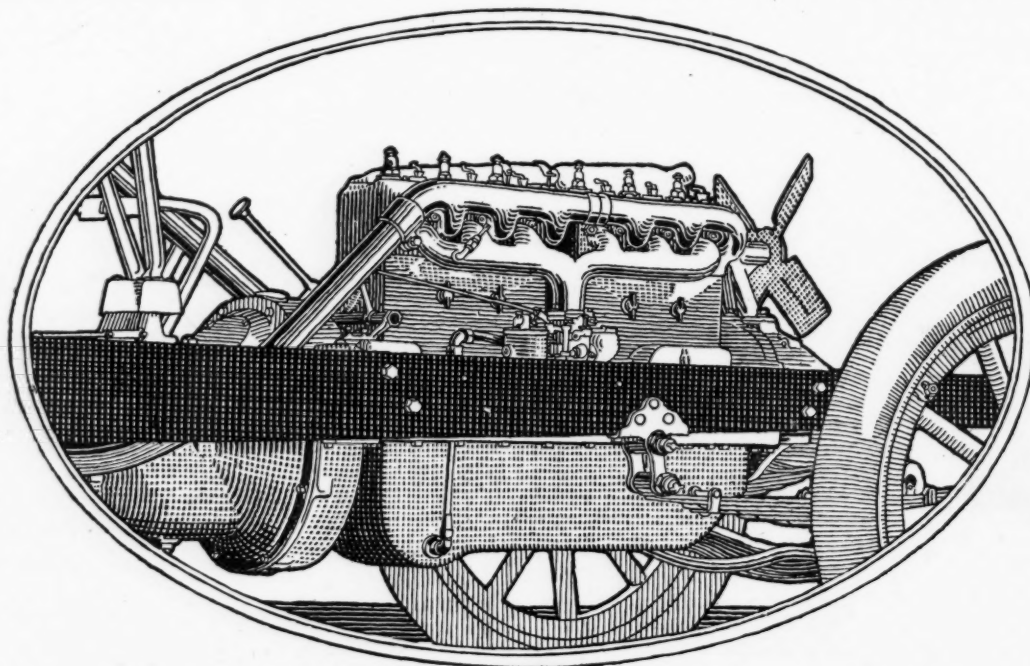
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